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1993 HAMILTON-WENTWORTH COLLISION REPORT

PREPARED BY:

TRAFFIC DEPARTMENT

City of HAMILTON

1993 Hamilton-Wentworth Collision Report

Prepared For:

The Transportation/Environmental Services Department
of the Regional Municipality of Hamilton-Wentworth

The Hamilton-Wentworth Regional Police Department

By:

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1993 HAMILTON-WENTWORTH MOTOR VEHICLE COLLISION REPORT

Introduction

This annual report is a summary of factors associated with traffic collisions that occurred in the Regional Municipality of Hamilton-Wentworth in 1993.

The Regional Municipality of Hamilton-Wentworth is situated in southern Ontario, at the westerly end of Lake Ontario. The following Municipalities are located within the Region: The Town of Ancaster, The Town of Dundas, The Town of Flamborough, The Township of Glanbrook, The City of Hamilton and The City of Stoney Creek. The projected total population of these combined localities was 451,684 in 1993 (based on 1991 population data).

Traffic collisions are a primary cause of accidental deaths, injuries and associated property losses. The intention of this report is to provide factual information to those agencies and persons concerned with the safety of the roadway transportation system within the Regional Municipality of Hamilton-Wentworth.

Traffic collisions frequently involve complex interactions between human behaviour, vehicle characteristics, and environmental conditions. The factor or factors responsible for causing a collision are not always the most obvious nor are they always readily apparent. Caution should be exercised in drawing conclusions from the statistics presented in this report and conclusions should be drawn only with appropriate qualifications and supportive information.

The information presented in this report is based primarily upon motor vehicle collisions investigated by the Hamilton-Wentworth Regional Police. All collisions occurring in Hamilton-Wentworth are included in the statistics in this report excluding collisions occurring on the Queen Elizabeth Way and Highway 403 and on-ramps and off-ramps to those highways. Collisions occurring on service roads to the Q.E.W. are included.

EXECUTIVE SUMMARY

* In 1993, 7,674 reported traffic collisions occurred on municipal roadways in the Regional Municipality of Hamilton-Wentworth. These collisions resulted in:
  - 12 driver or passenger fatalities (6 motor vehicle drivers, and 6 riders/passengers)
  - 4 pedestrian fatalities
  - 3,130 driver, cyclist or passenger injuries (not including fatalities)
  - 291 pedestrian injuries (not including fatalities)
  - 20,649 persons (equal to approximately 5 percent of the Regional population) being involved in a reported traffic collision
* The overall frequency of collisions in Hamilton-Wentworth is generally lower than other major Canadian municipalities.
* The frequency rate of fatalities in the City of Hamilton is lower than the average for other Canadian and U.S. cities of similar population.
* The period from 1 a.m. to 5 a.m. exhibits the highest ratio of collisions to vehicle volume using the street system.
* Drivers under the age of 35 years were involved in a disproportionate number of collisions relative to the age distribution of the licensed driving population of Ontario.
* The predominant improper driver action indicated in collisions was "failed to yield right-of-way".
* 5.2 percent of reported collisions involved one or more drivers who had been drinking.
* Most collisions involving alcohol occurred in the evening from 6 p.m. to 3 a.m. These figures are indicative of alcohol being present in the bloodstream of one or more of the drivers involved in the collision and do not necessarily mean that alcohol was the proximate cause of the collision.
* Pedestrians between the ages of 5 and 19 years of age were involved in a disproportionate number of collisions based on the age distribution of the population of Hamilton-Wentworth. Pedestrians in this age group were most frequently involved in a collision as the result of entering the roadway unexpectedly, coming from behind a parked vehicle, or disobeying a traffic signal.

1993 COMPARED WITH PREVIOUS YEARS

1. Overall Collisions

1,494 more collisions occurred in 1993 than in 1992. This contradicts the trend since 1989 that found the number of collisions generally decreasing (1991 to 1992 saw a slight increase of 0.6%). While the total number of reported collisions increased, the occurrence of injury collisions was virtually identical with 1991 and 1992. The number of fatal collisions in 1993 was the lowest in the past 3 decades and the number of injury collisions was less than 1% from the lowest for the same time period.

2. Bicycle Injuries

The number of people injured in motor vehicle collisions while riding on a bicycle decreased by 26 from 1992 to 1993. When the years 1990 - 1993 were compared to the period 1986 - 1989, the number of cyclists injured appears to be declining.

3. Pedestrian Fatalities

In 1993, the number of pedestrian fatalities (4) was the second lowest in 30 years.

4. Pedestrian Collisions Involving Five to Nine Year Olds

In 1993 as in 1992, 42 5-9 year old pedestrians were involved in collisions. In the years 1989 to 1991 the rate was 52/year on the average. For comparison, data for the years 1980 through 1983 were 90 collisions, 72 collisions, 107 collisions and 79 collisions respectively. In 1988 there were 75 collisions. The data for the years 1984 to 1987 is not available. The number of collisions involving five to nine year olds has generally declined over the past decade and appears to be at its lowest level.

5. Alcohol Involvement

Alcohol involvement in motor vehicle collisions has been, on average, steadily decreasing since 1978. In the years 1988 to present, alcohol involvement in collisions averaged 6.3 percent, compared to 10.3 percent for the previous 12 years. The rate of 5.2 percent in 1993 was the lowest recorded by this report (17 years).

6. Driver Action

In previous years, drivers in the 16-19 and 20-24 year old age groups were less likely than average to be found to be driving properly. In 1993 both of these groups were substantly better than the norm for all drivers. Conversely, the 65-74 and 75+ age groups had poorer performance than in previous years.

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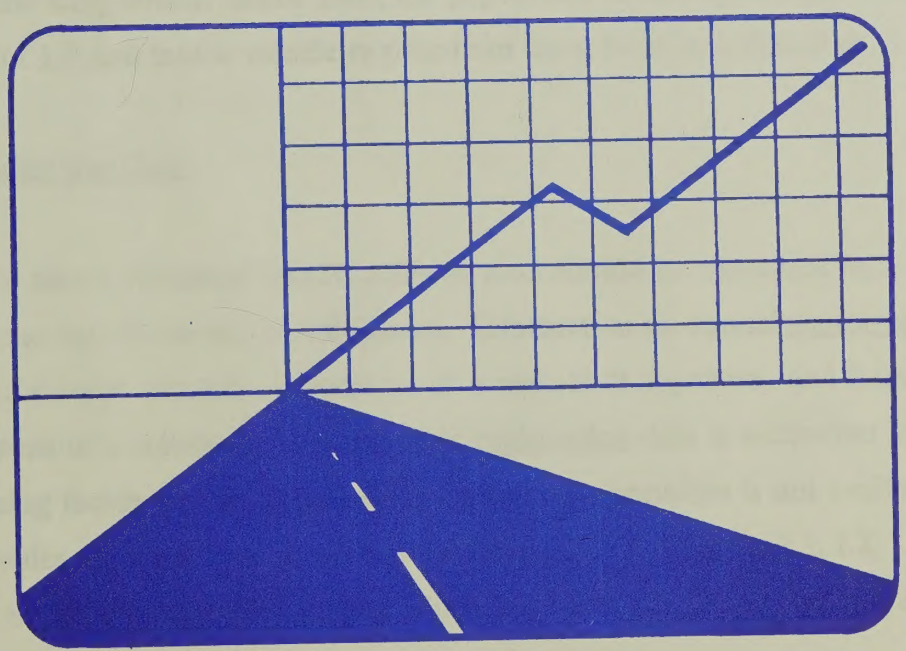
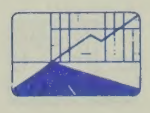
Chapter One
Trends



Chapter One
Trends

Chapter One
Trends



Chapter 1

General

Since peaking in 1965 the overall number of motor vehicle collisions, and the number of pedestrians injured in motor vehicle collisions in the Regional Municipality of Hamilton-Wentworth has exhibited a steadily decreasing trend (Exhibits 1.4, 1.6). The number of collisions resulting in a fatality has remained relatively constant during the same time period (Exhibits 1.4, 1.5), while personal injuries have fluctuated widely but are presently at the level of the early 1960's. Since 1965, the population of the reporting area has increased by a factor of 1.6 and motor vehicle registrations have risen by a factor of 3.

Normalizing the Data

To assess historical trends, collision data should be expressed as a normalized rate through the use of one of several factors. Information on annual motor vehicle use would provide the most accurate assessment of a motorist's exposure, and hence, likelihood of involvement in a collision. Motor vehicle registration data is somewhat less accurate as a normalizing factor, but is utilized since exposure information is not available. Population also provides a suitable and accurate normalizing factor. Exhibits 1.1, 1.2, 1.3 and associated analysis in this chapter refer to data which has been calculated on a population *rate* basis (based on 1991 population data).

Collisions

The overall motor vehicle collision rate is shown in Exhibit 1.1. As of January 1, 1978, the reporting level for property damage only collisions was raised from $200.00 to $400.00. In January 1, 1985, it was raised again from $400.00 to $700.00. Due to these changes, trend analysis cannot be conducted on property damage collisions (Exhibit 1.4). The rate for total collisions appears to show a decline from 1977 to 1992. 1993 shows the first significant increase in five years. However, due to the changes in the reporting criteria and reporting area (this reporting area increased in 1974) for the period for which historical data are available, trend analysis on the number of collisions would not be appropriate or meaningful.

The rate of collisions involving injury or fatality shows a modest decline from 1973 to 1993 (Exhibit 1.1). Individual trends of injuries and fatalities are discussed below.

Injuries

The rate of personal injury (Exhibits 1.2, 1.5) is rather volatile. However since 1989, the rate of personal injuries has been on the decline and the rate of personal injury from 1991 - 1993 is the lowest it has been since 1961. This volatility is likely related to the nature and severity of the collisions which could be the result of a number of factors. The rate for pedestrian injuries (Exhibits 1.3, 1.6) shows a significant and continuing decline from 1966 to 1993.

Fatalities

In 1993, sixteen persons died in motor vehicle collisions in Hamilton-Wentworth. This is the lowest number in the past 30 years. However, it is recognized that fatal collisions are rare events and small changes in the number of fatalities cause large fluctuations in the fatality rate (Exhibit 1.2, 1.4). These fluctuations reduce the validity of statistical tests. Thus while the fatality rate for personal fatalities shows a slight downward trend, especially since 1978, this trend is not statistically significant.

The fatality rate for pedestrians (Exhibit 1.3, 1.6) does display a significant reduction, especially since 1978.

Alcohol Involvement

When viewed as a proportion of overall collisions, alcohol involvement (Exhibit 1.7) has been, on average, steadily decreasing since 1978. In the years 1988 to 1992 collision involvement remained relatively constant with an average of 6.1 percent which is much lower than the previous 12 year average of 10.3 percent. The 1993 percentage of 5.1 is the lowest in the 17 years this report has compiled the statistic. The percentage of total fatal

collisions that were alcohol related has been generally decreasing since 1984, with the exception of 1989. An average of 17 percent of all fatal collisions between 1984 and the present have been alcohol related, with the average for the past three years being 9 percent. However, in 1993, that statistic jumped to 26.7 percent. The percentage of impaired/had been drinking drivers under the age of 21 has steadily been declining since 1979, with the exception of 1986. The 1993 percentage of young drivers in collisions who had been drinking was lower than any year except 1992. These figures indicate that, in recent years, alcohol involvement in collisions is declining.

Exhibit 1.1

MOTOR VEHICLE COLLISIONS: HISTORY OF RATES OF TOTAL COLLISIONS & COLLISIONS CAUSING INJURY/FATALITY

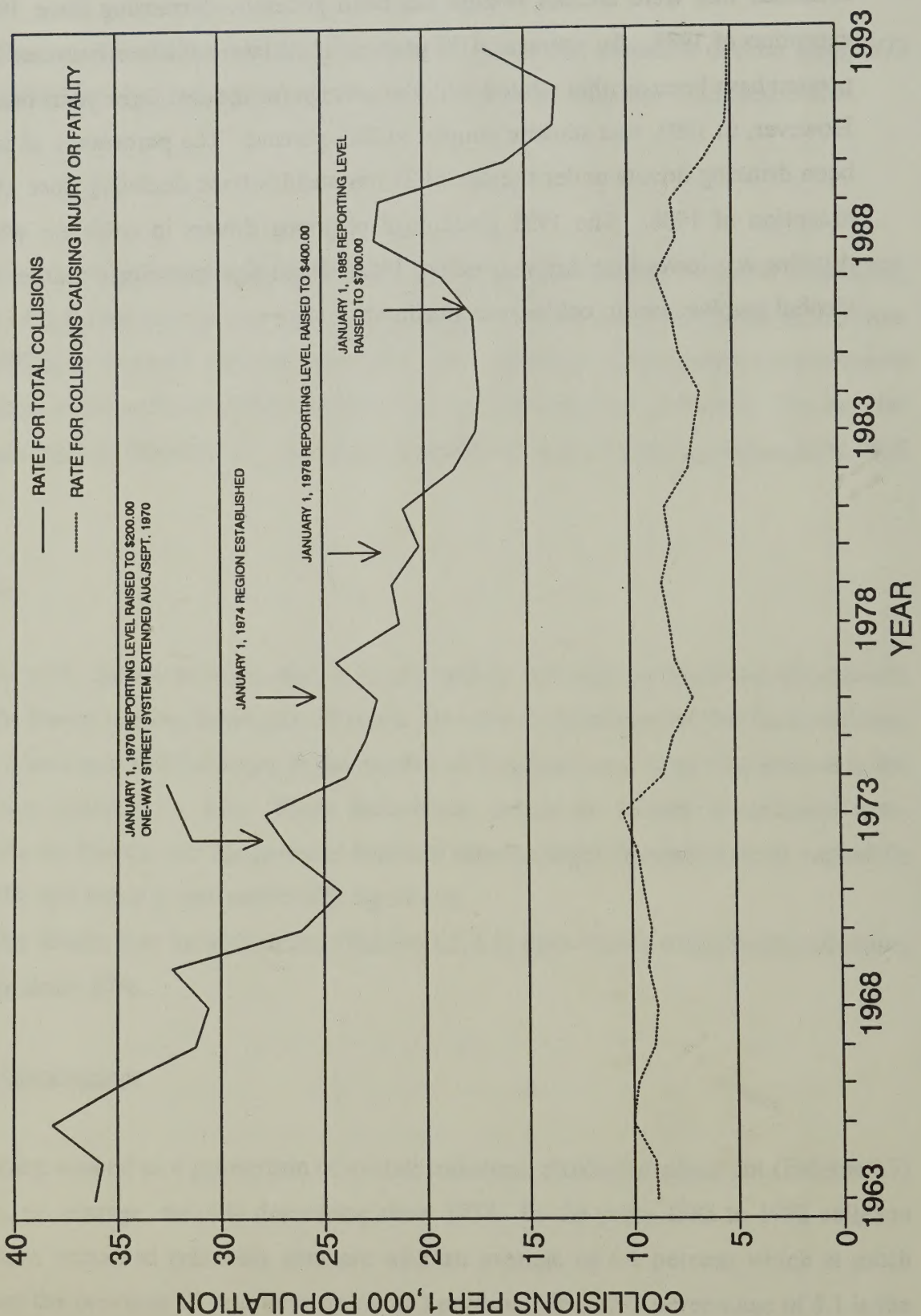


Exhibit 1.2

PERSONAL INJURIES/FATALITIES: HISTORY OF INJURY AND FATALITY RATES CAUSED BY MOTOR VEHICLE COLLISIONS

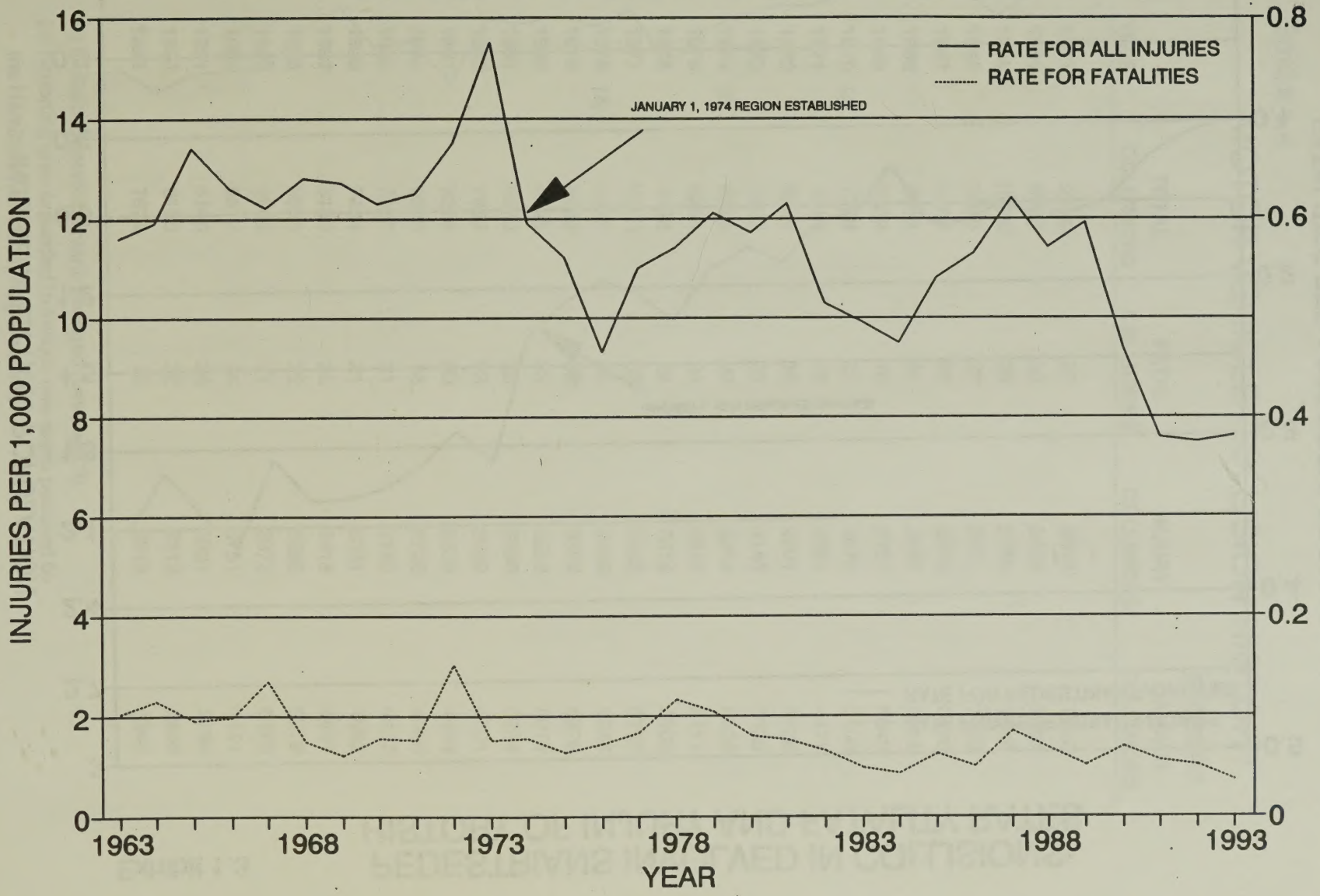


Exhibit 1.3

PEDESTRIANS INVOLVED IN COLLISIONS: HISTORY OF INJURY AND FATALITY RATES

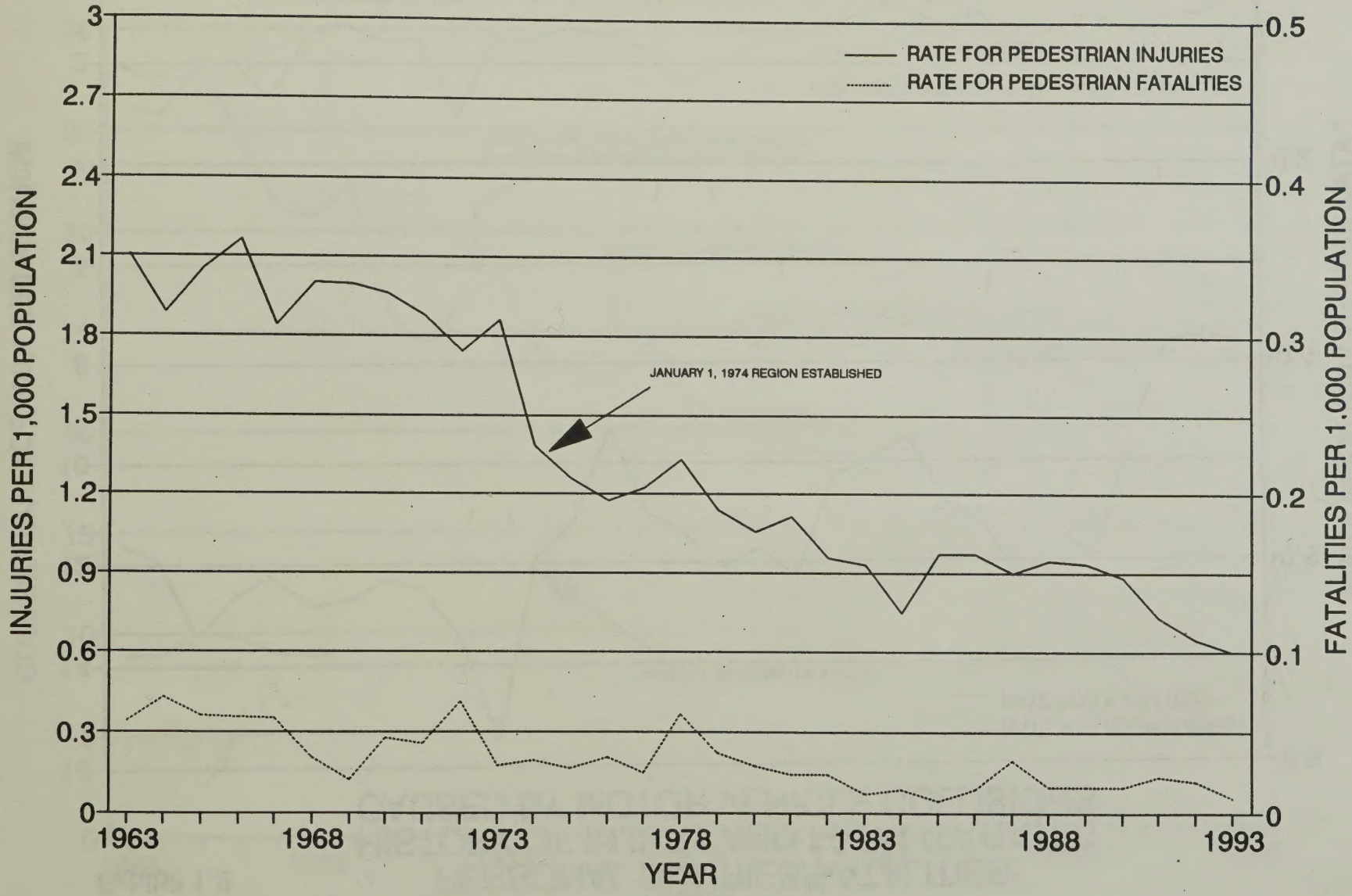


Exhibit 1.4

MOTOR VEHICLE COLLISION HISTORY

YEAR	TOTAL COLLISIONS	FATAL COLLISIONS	INJURY COLLISIONS	PROPERTY DAMAGE COLLISIONS
1963	9554	27	2309	7218
1964	9948	32	2455	7461
1965	10783	26	2789	7968
1966	9950	27	2757	7166
1967	9106	35	2575	6496
1968	8983	21	2547	6415
1969	9589	19	2721	6849
1970 (a)	7799	23	2676	5100
1971	7314	22	2821	4471
1972	8065	39	2901	5125
1973	8499	23	3143	5333
1974 (b)	9599	29	3364	6206
1975	9354	24	3219	6111
1976	9146	28	2816	6302
1977	10011	33	3182	6796
1978 (a)	8636	45	3246	5345
1979	8798	39	3389	5370
1980	9305	33	3253	5019
1981	8660	28	3398	5234
1982	7663	23	2939	4701
1983	7268	20	2839	4409
1984	7228	18	2726	4484
1985	7346	21	3153	4172
1986	7434	21	3331	4082
1987	8140	35	3615	4491
1988	9586	22	3285	6279
1989	9566	21	3372	6173
1990	6917	25	2751	4141
1991	6145	25	2331	3789
1992	6180	22	2312	3846
1993	7674	15	2313	5346

(a) Collision reporting criteria changed (see page 3).

(b) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

Exhibit 1.5

HISTORY OF PERSONAL INJURIES AND FATALITIES CAUSED BY MOTOR VEHICLE COLLISIONS

YEAR	TOTAL COLLISIONS	PERSONS INJURED	PERSONAL INJURIES/1,000 POPULATION	NUMBER OF FATALITIES	FATALITIES/ 100,000 POPULATION	FATALITIES/ 10,000 REGISTERED VEHICLES	
1962	8338	2542	9.5	32	11.9	3.82	
1963	9554	3075	11.6	27	10.2	3.03	
1964	9948	3305	11.9	32	11.5	3.43	
1965	10783	3824	13.4	27	9.5	2.64	
1966	9950	3746	12.6	28	9.8	2.60	
1967	9106	3484	12.2	39	13.7	3.63	
1968	8983	3573	12.8	22	7.9	1.89	
1969	9589	3768	12.7	19	6.4	1.64	
1970 (a)	7799	3717	12.3	23	7.5	2.00	
1971	7314	3876	12.5	23	7.0	1.91	
1972	8065	4055	13.5	46	15.3	3.42	(b)
1973	8499	4951	15.5	23	7.2	1.63	
1974 (c)	9599	4678	11.9	31	7.9	2.00	(b)
1975	9354	4474	11.2	26	6.5	1.60	(b)
1976	9146	3811	9.3	29	7.1	1.78	(b)
1977	10011	4513	11.0	34	8.3	2.00	(b)
1978 (a)	8636	4635	11.4	47	11.6	2.06	(d)
1979	8798	4923	12.1	42	10.3	2.20	(d)
1980	8305	4800	11.7	33	8.0	1.43	(d)
1981	8660	5015	12.3	31	7.6	1.12	(d)
1982	7663	4175	10.3	27	6.6	0.91	
1983	7268	4041	9.9	20	4.9	1.05	(e)

1984	7228	3855	9.5	18	3.8	0.83	(e)
1985	7346	4529	10.8	26	6.2	1.16	(e)
1986	7434	4758	11.3	21	5.0	0.90	(e)
1987	8140	5220	12.4	36	8.4	1.50	(e)
1988	9586	4898	11.4	29	6.8	1.17	(e)
1989	9566	5145	11.9	22	5.1	0.87	(e)
1990	6917	4053	9.4	30	6.9	1.18	(e)
1991	6145	3420	7.6	25	5.5	0.96	(d)
1992	6180	3439	7.5	23	5.0	0.75	(e)
1993	7674	3421	7.6	16	3.5	0.51	(e)

(a) Collision reporting criteria changed (see page 3).

(b) Registration estimated from total Ontario registrations.

(c) Reporting area expanded to include new areas patrolled by the Hamilton-Wentworth Regional Police.

(d) Registration data from licence information.

(e) Registration data from licence information for Wentworth County.

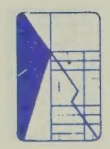


Exhibit 1.6

HISTORY OF PEDESTRIAN AND CYCLIST INJURIES AND FATALITIES

YEAR	COLLISIONS INVOLVING PEDESTRIANS (c)	PEDESTRIANS INJURED (a)	PEDESTRIAN FATALITIES	COLLISIONS INVOLVING CYCLISTS (c)	CYCLISTS INJURED (a)	CYCLIST FATALITIES
1963		558	15		120	1
1964		526	20		120	0
1965		582	17		140	0
1966		618	17		132	1
1967		537	17		113	0
1968		588	10		84	1
1969		602	6		91	2
1970		586	14		101	1
1971		570	13		155	2
1972		530	21		156	2
1973		569	9		197	1
1974 (b)		555	13		192	3
1975		513	11		235	0
1976		480	14		195	0
1977		503	10		193	3
1978		542	25		162	1
1979		464	15		177	4
1980		434	12		178	1
1981		458	10		159	1
1982		396	10		252	2
1983		387	5		200	2
1984		314	6		175	1
1985		410	3		239	2
1986	384	412	6	229	228	2
1987	379	383	14	244	244	2
1988	401	406	7	239	225	0
1989	411	403	7	164	154	3
1990	381	383	7	208	195	0
1991	332	330	10	193	185	3
1992	300	297	9	219	209	3
1993	299	291	4	201	183	0

(a) One or more pedestrian\cyclist could be involved and a fatality\injury may not have occurred.

(b) Prior to this year, reporting was for the City of Hamilton only.

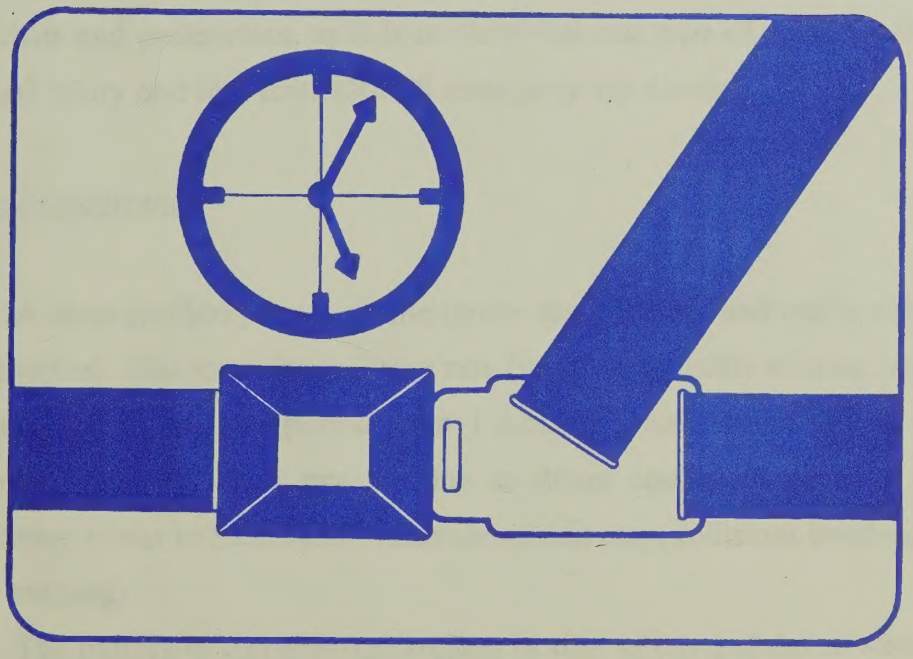
(c) This information was not available until 1986.

Exhibit 1.7

HISTORY OF ALCOHOL-RELATED MOTOR VEHICLE COLLISIONS

YEAR	TOTAL REPORTED COLLISIONS	TOTAL ALCOHOL-RELATED COLLISIONS (a)	PERCENTAGE OF TOTAL COLLISIONS INVOLVING ALCOHOL	% IMPAIRED OR HAD BEEN DRINKING DRIVERS UNDER THE AGE OF 21	TOTAL FATAL COLLISIONS	ALCOHOL-RELATED FATAL COLLISIONS (a)	% FATAL COLLISIONS HAVING ALCOHOL INVOLVED
1977	10011	1175	11.7	20.4	33	5	15.2
1978	8636	1128	13.1	22.1	45	11	24.4
1979	8798	1139	12.9	22.1	39	5	12.8
1980	8305	929	11.2	18.7	33	11	33.3
1981	8660	1053	12.2	16.4	28	8	28.6
1982	7663	895	11.7	19.0	23	3	13.0
1983	7268	765	10.5	18.6	20	5	25.0
1984	7228	729	10.1	15.0	18	5	27.8
1985	7346	644	8.8	12.7	21	5	23.8
1986	7434	596	8.0	20.5	21	4	19.0
1987	8140	589	7.2	11.9	35	5	14.3
1988	9586	582	6.1	9.9	22	2	9.1
1989	9566	542	5.7	6.7	21	6	28.6
1990	6917	430	6.2	6.6	25	4	16.0
1991	6145	385	6.3	7.6	25	3	12.0
1992	6180	398	6.4	2.1	22	0	0.0
1993	7674	397	5.1	5.5	15	4	26.7

(a) Includes drivers classified as impaired due to alcohol or classified as having been drinking (refer to Exhibit 3.5 for a more detailed description of categories).



Chapter Two
Selected Characteristics

Chapter Two
Selected Characteristics

Chapter 2

Injuries

Of the 20,649 persons involved in collisions in 1993, 3,437 received injuries. The chance of an involved person sustaining an injury in a collision varied from 14.4 percent for a motor vehicle passenger, to 95.5 percent for a pedestrian. The risk of injury appears to be significantly higher for cyclists and pedestrians (Exhibit 2.1). The percentages are high for cyclists and pedestrians, as it is unlikely that this type of collision could occur with no personal injury and less than $700.00 total property damage.

Time of Occurrence

A close similarity between the trends for collisions and traffic volumes (Exhibit 2.2) was observed. However, the collision rate (in terms of traffic volume) was greater than the daily average during the period from 1 a.m. to 5 a.m., when 463 or 6.0 percent of all collisions occurred. This may be due to driver conditions such as fatigue or alcohol impairment (refer to Exhibit 3.4 which shows that most collisions involving alcohol occurred in the evening).

The pattern of collision occurrences by time of day and day of week was summarized, and the differences found in the pattern of collision occurrence reflected traffic volumes. The highest number of collisions (1252) occurred between the hours of 3 p.m. to 5 p.m. (Exhibit 2.3) with the highest percentage of collisions occurring on Fridays (Exhibit 2.4).

The pattern of collision occurrences was compared on a month of year basis (Exhibit 2.5) and there was a difference in the number of collisions which occurred each month. The higher number of collisions occurred during the fall months. There is no obvious reason for this pattern.

Impact Type

The type of initial impact was compared with the injury classification of the collisions (Exhibit 2.6). The probability of an injury or fatality resulting from a collision was highest in "head on" (46.3%) and "pedestrian/vehicle" (97.5%) collision types. However, these collision types only make up 5.6 percent of the total collisions. The majority of collisions were either "rear end" (1743) or "right angle" (1426) in nature.

Greater than one half of all collisions were associated with intersections (Exhibit 2.7). 35.1 percent of collisions occurred at or near signalized intersections and 28.6 percent occurred at or near intersections with stop or yield control (Exhibit 2.8). 35.7 percent of all collisions occurred at locations with no form of traffic control.

Exhibit 2.1

INJURY STATUS OF ALL PERSONS INVOLVED

DESCRIPTION OF PERSONS INVOLVED	PERSONS INVOLVED	PERSONAL INJURIES & FATALITIES	% OF PERSONS INJURED/ PERSONS INVOLVED	TYPE OF INJURY*			
				FATAL	MAJOR	MINOR	MINIMAL
DRIVER	12849	1909	14.9%	6	85	706	1112
CYCLIST	208	183	88.0%	0	15	84	84
PASSENGER	7283	1050	14.4%	6	47	378	619
PEDESTRIAN	309	295	95.5%	4	35	128	128
TOTAL	20649	3437	16.6%	16	182	1296	1943

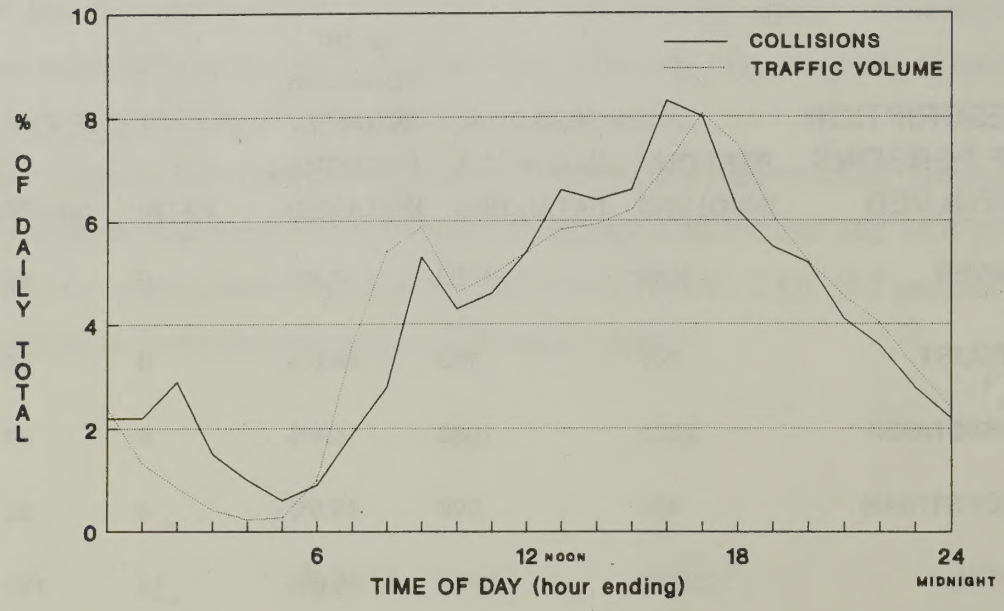
FOR APPROXIMATELY EVERY 21 RESIDENTS OF THE REGIONAL MUNICIPALITY OF HAMILTON–WENTWORTH, 1 PERSON WAS INVOLVED IN A MOTOR VEHICLE COLLISION IN 1993.

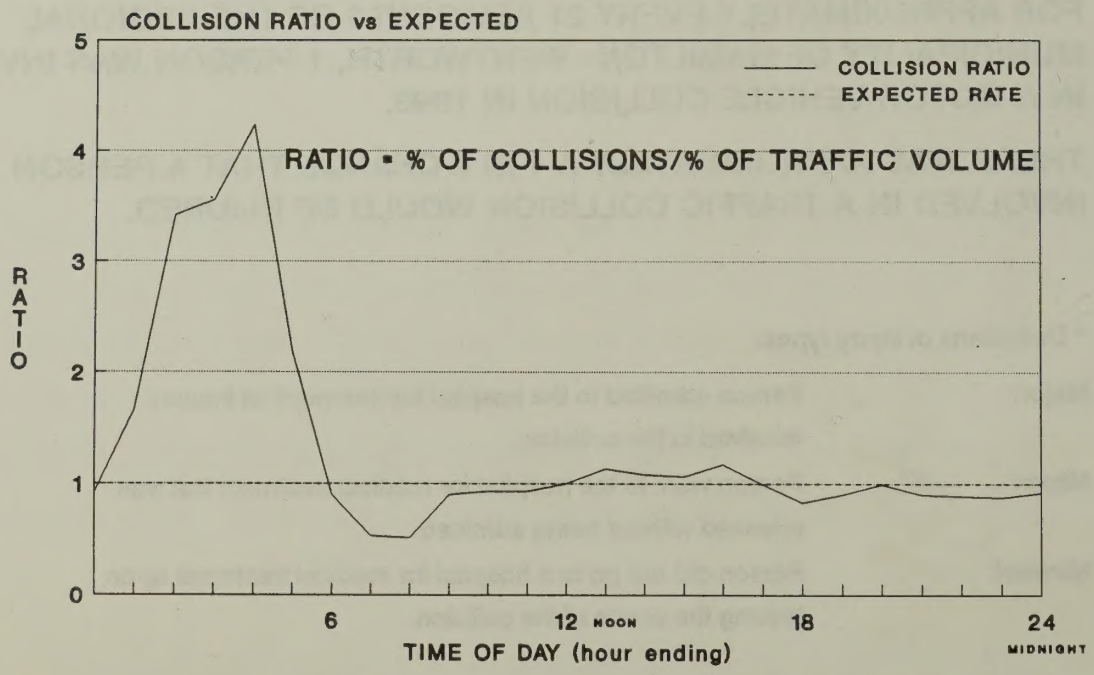
THERE WAS APPROXIMATELY A 1 IN 6 CHANCE THAT A PERSON INVOLVED IN A TRAFFIC COLLISION WOULD BE INJURED.

* Definitions of injury types:

Major:	Person admitted to the hospital for treatment of injuries received in the collision.
Minor:	Person went to the hospital for medical treatment but was released without being admitted.
Minimal:	Person did not go to a hospital for medical treatment upon leaving the scene of the collision.

Exhibit 2.2
TIME OF DAY vs TRAFFIC VOLUME



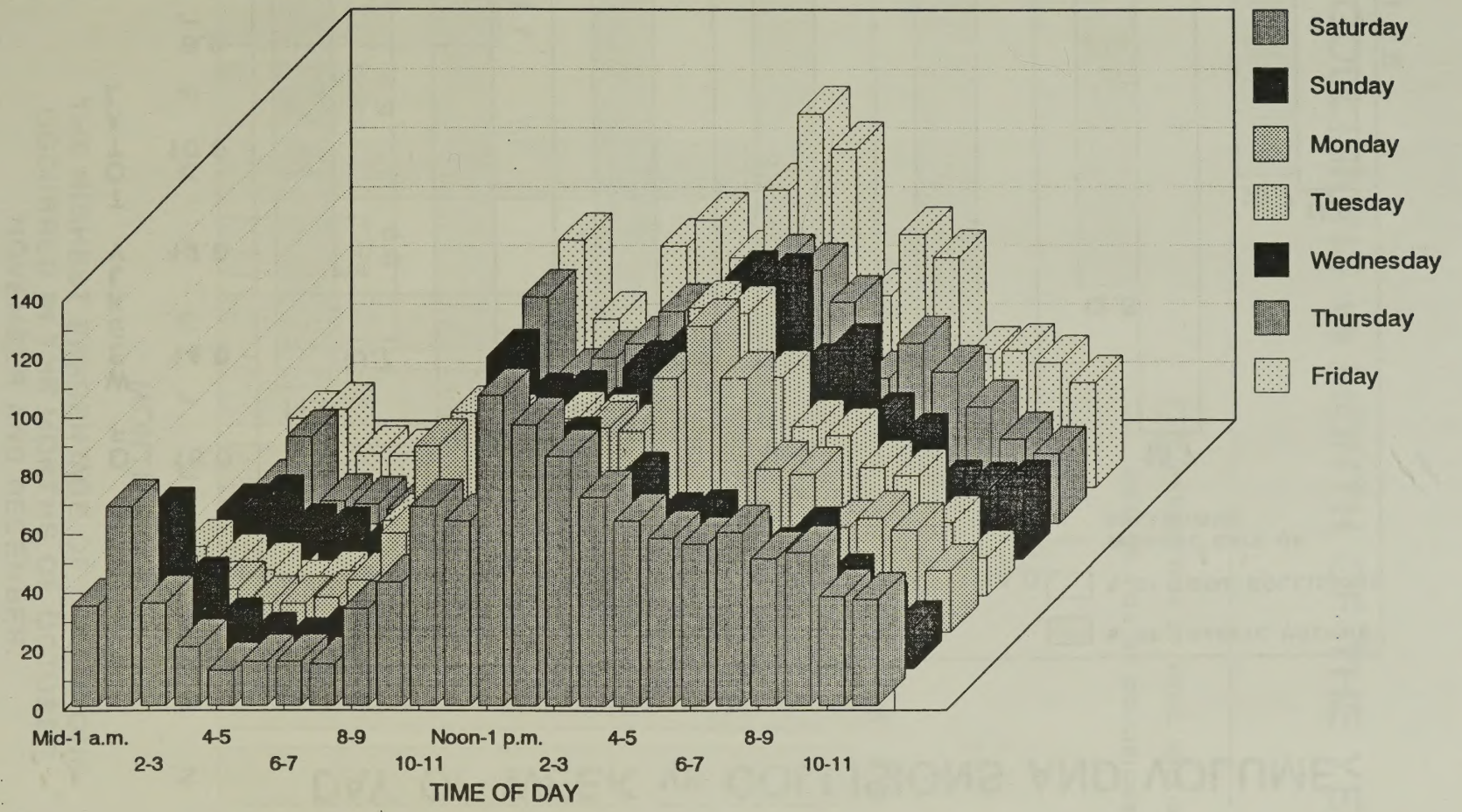


COLLISIONS OCCURRED AT A MUCH HIGHER THAN EXPECTED RATE (RELATIVE TO TRAFFIC VOLUME) BETWEEN 1 A.M AND 5 A.M DAILY

Exhibit 2.3

COLLISION OCCURENCES BY TIME OF DAY AND DAY OF WEEK

NUMBER OF COLLISIONS IN EACH HOUR

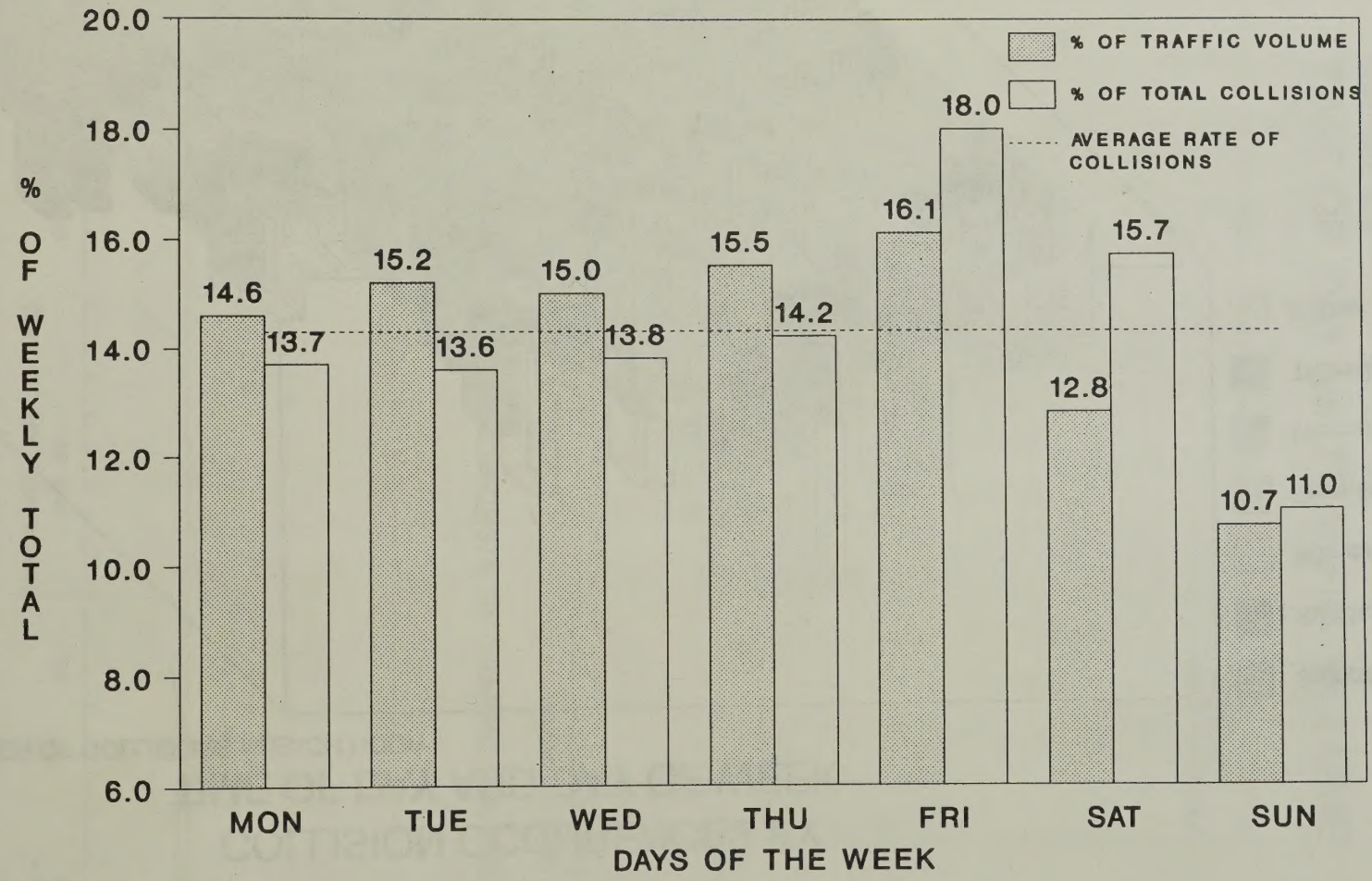


COLLISIONS WERE MOST LIKELY TO OCCUR

BETWEEN 3 p.m. and 5 p.m. on FRIDAYS

Exhibit 2.4

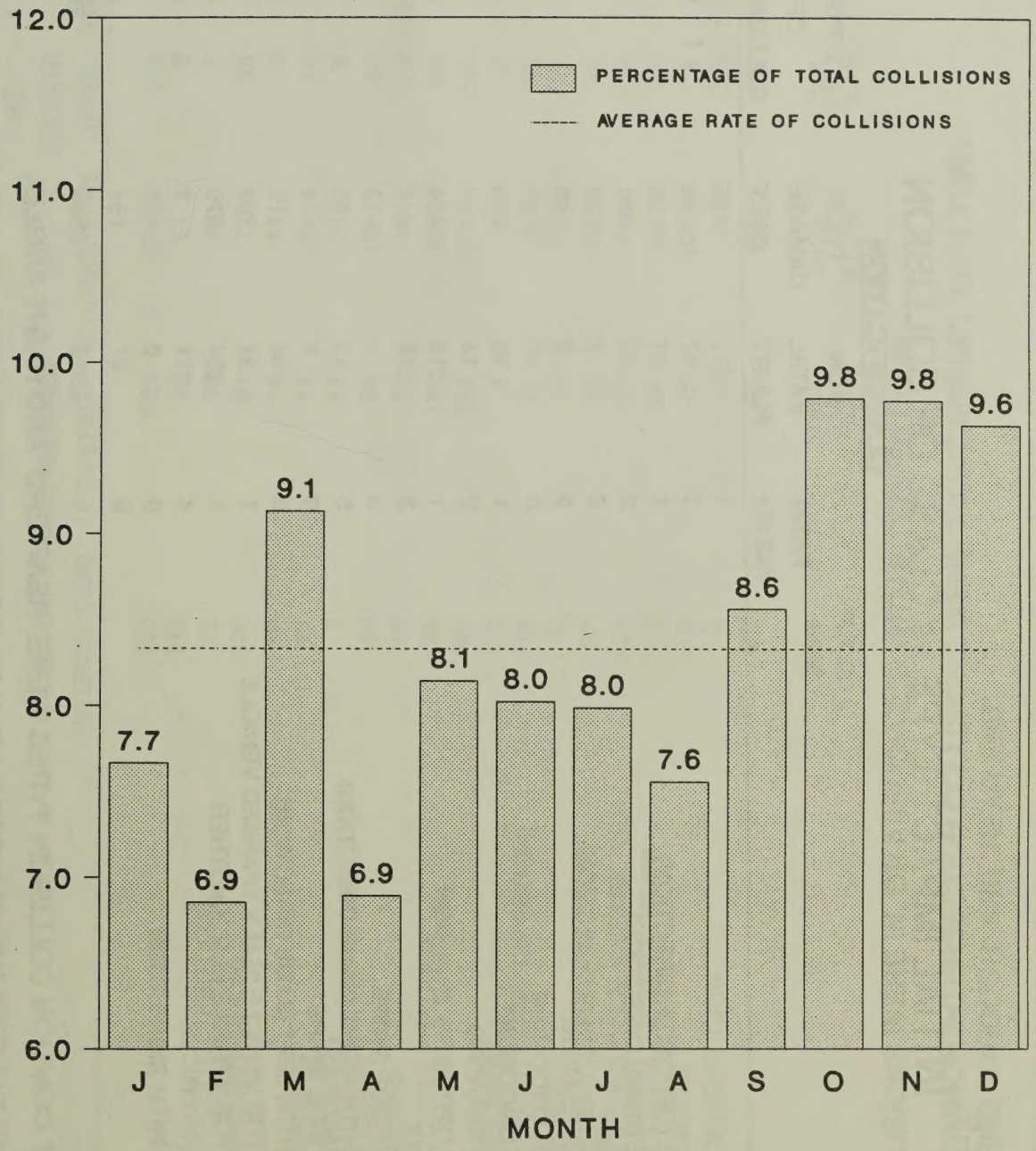
DAY OF WEEK vs COLLISIONS AND VOLUME



FRIDAYS, SATURDAYS AND SUNDAYS HAD MORE COLLISIONS THAN EXPECTED WHEN COMPARED TO TRAFFIC VOLUME. THE HIGHEST NUMBER OF COLLISIONS OCCURRED ON FRIDAYS.

Exhibit 2.5

COLLISIONS vs MONTH OF THE YEAR



THE HIGHEST PERCENTAGE OF COLLISIONS OCCURRED IN THE MONTHS OF OCTOBER, NOVEMBER AND DECEMBER.

Exhibit 2.6

INITIAL IMPACT TYPE vs CLASS OF COLLISION

INITIAL IMPACT TYPE	CLASSIFICATION				% OF TYPE INVOLVING INJURY/ FATALITY
	FATAL INJURY	NON-FATAL INJURY	PROP. DAMAGE ONLY	ALL TYPES OF COLLISIONS	
REAR END	1	617	1125	1743	35.5%
HEAD ON	2	67	80	149	46.3%
SIDE SWIPE (OPPOSITE DIRECTION)	1	27	95	123	22.8%
SIDE SWIPE (SAME DIRECTION)	0	53	484	537	9.9%
OVERTAKING	0	7	73	80	8.8%
RIGHT TURN REAREND	0	5	65	70	7.1%
RIGHT TURN ONCOMING	0	17	34	51	33.3%
LEFT TURN ONCOMING	1	70	190	261	27.2%
LEFT TURN REAREND	0	14	93	107	13.1%
LEFT TURN OPPOSING THROUGH	1	218	404	623	35.2%
RIGHT ANGLE	3	576	847	1426	40.6%
RIGHT TURN SIDE SWIPE	0	1	13	14	7.1%
THROUGH WITH RIGHT (SAME DIRECTION)	0	19	65	84	22.6%
LEFT TURN SIDE SWIPE	0	1	14	15	6.7%
THROUGH WITH LEFT (SAME DIRECTION)	0	34	178	212	16.0%
SINGLE MOTOR VEHICLE (S.M.V.)/PARKED VEHICLE	1	31	707	739	4.3%
SINGLE MOTOR VEHICLE (S.M.V.)/OTHER	1	254	679	934	27.3%
PEDESTRIAN/VEHICLE	4	271	7	282	97.5%
LEFT TURN WITH RIGHT TURN	0	0	9	9	0.0%
OTHER	0	31	184	215	14.4%
TOTAL	15	2313	5346	7674	

THE MOST COMMON COLLISION TYPES WERE 'REAR END' AND RIGHT ANGLE'.

INJURIES/FATALITIES WERE MOST LIKELY TO OCCUR IN "PEDESTRIAN/VEHICLE" & "HEAD ON" COLLISIONS.

THE HIGHEST NUMBER OF INJURIES WERE IN 'REAR END' AND 'RIGHT ANGLE' COLLISIONS.

(a) The traffic movements causing these collisions are shown diagrammatically on the chart in Appendix A.1.

Exhibit 2.7

INITIAL IMPACT TYPE vs ROAD CLASSIFICATION

INITIAL IMPACT TYPE	ROAD LOCATION					
	NON-INTERSECTION	INTERSECTION RELATED	IN INTERSECTION	AT PRIVATE DRIVE	OTHER (a)	TOTAL
REAR END	733	504	374	112	20	1743
HEAD ON	110	16	17	2	4	149
SIDE SWIPE (OPPOSITE DIRECTION)	89	16	10	5	3	123
SIDE SWIPE (SAME DIRECTION)	326	91	77	35	8	537
OVERTAKING	45	14	14	5	2	80
RIGHT TURN REAREND	11	17	24	18	0	70
RIGHT TURN ONCOMING	8	12	24	7	0	51
LEFT TURN ONCOMING	40	59	104	57	1	261
LEFT TURN REAREND	16	31	47	13	0	107
LEFT TURN OPPOSING THROUGH	35	130	398	60	0	623
RIGHT ANGLE	88	289	907	135	7	1426
RIGHT TURN SIDE SWIPE	1	3	8	2	0	14
THROUGH WITH RIGHT (SAME DIRECTION)	18	16	30	19	1	84
LEFT TURN SIDE SWIPE	0	7	7	1	0	15
THROUGH WITH LEFT (SAME DIRECTION)	27	44	100	40	1	212
SINGLE MOTOR VEHICLE (S.M.V.)/PARK. VEH.	538	35	40	113	13	739
SINGLE MOTOR VEHICLE (S.M.V.)/OTHER	603	124	109	43	55	934
PEDESTRIAN/VEHICLE	119	45	107	9	2	282
LEFT TURN WITH RIGHT TURN	0	5	4	0	0	9
OTHER	82	26	34	72	1	215
TOTAL	2889	1484	2435	748	118	7674
%	37.6%	19.3%	31.7%	9.7%	1.5%	100.0%

51% OF COLLISIONS WERE IN, OR ASSOCIATED WITH INTERSECTIONS.

THE MOST COMMON INTERSECTION COLLISIONS WERE 'RIGHT ANGLE', 'LEFT TURN WITH OPPOSING THROUGH' AND 'REAR END'.

THE MOST COMMON NON-INTERSECTION COLLISIONS WERE 'REAR END' AND 'SINGLE MOTOR VEHICLE'.

(a) "OTHER" includes 'at railroad', 'underpass or tunnel', 'overpass or bridge' and 'other'.

Exhibit 2.8

INITIAL IMPACT TYPE vs TYPE OF TRAFFIC CONTROL

TYPE OF TRAFFIC CONTROL AT LOCATION (a)

INITIAL IMPACT TYPE	TRAFFIC SIGNAL	STOP SIGN	YIELD SIGN	POLICE CONTROL	SCHOOL GUARD	SCHOOL BUS	TRAFFIC GATE	TRAFFIC CONTROL PERSON*	NO TRAFFIC CONTROL	OTHER	TOTAL
REAR END	797	299	34	3	2	2	0	4	601	1	1743
HEAD ON	16	34	2	0	0	0	2	0	94	1	149
SIDE SWIPE (OPPOSITE DIRECTION)	14	24	1	0	0	0	0	0	83	1	123
SIDE SWIPE REAR	187	70	5	0	0	0	0	1	273	1	537
OVERTAKING	25	12	1	0	0	0	0	0	42	0	80
RIGHT TURN REAR END	35	18	1	0	0	0	0	0	15	1	70
RIGHT TURN ONCOMING	11	29	1	0	0	0	0	0	10	0	51
LEFT TURN ONCOMING	52	148	2	0	0	0	0	0	58	1	261
LEFT TURN REAR END	25	49	5	0	0	0	0	0	28	0	107
LEFT TURN OPPOSING THROUGH	433	103	3	0	0	0	0	0	83	1	623
RIGHT ANGLE	590	662	9	1	1	1	0	1	159	2	1426
RIGHT TURN SIDE SWIPE	8	4	0	0	0	0	0	0	2	0	14
THRU. WITH RIGHT (SAME DIRECT'N)	39	17	0	0	0	0	0	0	28	0	84
LEFT TURN SIDE SWIPE	11	2	0	0	0	0	0	0	2	0	15
THRU. WITH LEFT (SAME DIRECT'N)	93	56	0	0	0	0	0	0	62	1	212
S.M.V./PARKED VEHICLE	57	210	2	0	1	0	0	0	468	1	739
S.M.V./OTHER	158	241	6	0	0	1	2	3	521	2	934
PEDESTRIAN/VEHICLE	106	74	2	0	1	1	0	3	95	0	282
LEFT TURN WITH RIGHT TURN	7	1	1	0	0	0	0	0	0	0	9
OTHER	32	62	1	0	0	0	0	0	119	1	215
TOTAL	2696	2115	76	4	5	5	4	12	2743	14	7674
%	35.1%	27.6%	1.0%	0.1%	0.1%	0.1%	0.1%	0.2%	35.7%	0.2%	100.0%

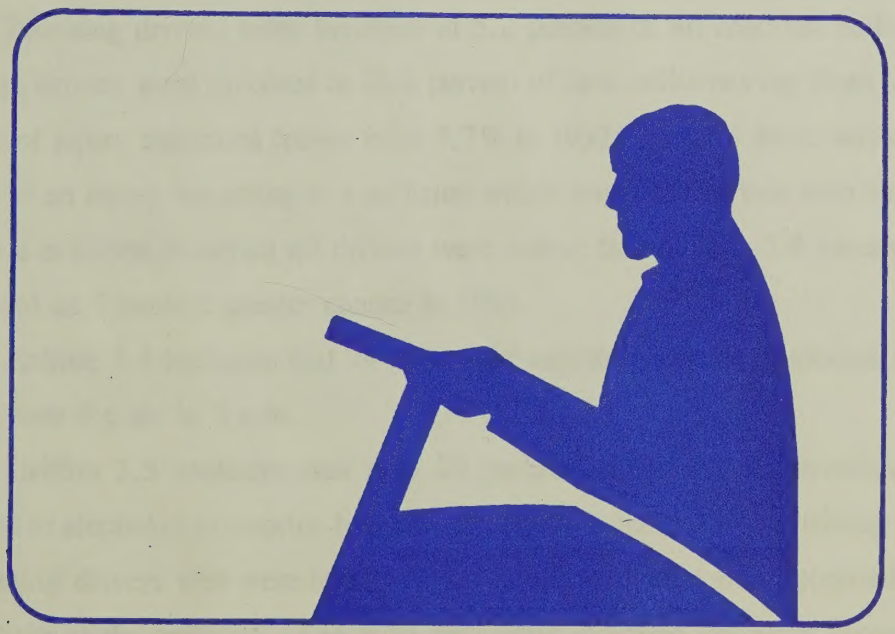
36% OF ALL COLLISIONS OCCURRED AT LOCATIONS WITH NO TRAFFIC CONTROL.

THE MOST COMMON COLLISION TYPE AT A TRAFFIC SIGNAL WAS 'REAR END'.

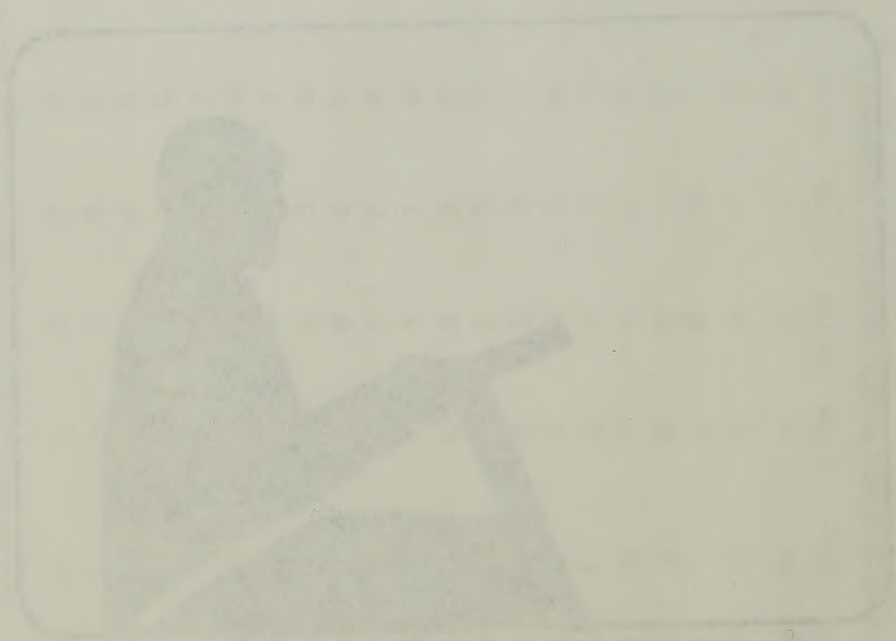
THE MOST COMMON COLLISION TYPE AT A STOP SIGN WAS 'RIGHT ANGLE'.

(a) Includes all collisions at both intersection and non-intersection locations.

* Any person directing traffic who is not a police officer or school crossing guard.



Chapter Three
Drivers



Driver Age

Although persons under the age of 25 make up only 14.8 percent of the licensed driving population, this age group was represented by 17.4 percent of drivers reported in collisions. (Exhibit 3.1).

Drivers over the age of 64, involved in a collision, were recorded as driving properly 38.5 percent of the time. The most frequent improper driving action recorded for this group was "failed to yield right-of-way" (Exhibit 3.2).

Drinking Drivers

Drinking drivers were involved in 5.2 percent of all reported collisions (Exhibit 3.3). Drinking drivers were involved in 26.6 percent of fatal collisions (up from 0% in 1992) and 6.8 percent of injury collisions (down from 7.7% in 1992). In 1985 there was a 33 percent greater chance of an injury occurring in a collision which involved a driver who had consumed alcohol than in a collision in which all drivers were sober; there was a 7-8 percent greater chance in 1992, and an 7 percent greater chance in 1993.

Exhibit 3.4 indicates that 74 percent of collisions involving alcohol occurred during the period from 6 p.m. to 3 a.m.

Exhibit 3.5 indicates that only 22 percent of the drivers involved in collisions who admitted to alcohol consumption but were not legally impaired, were driving properly. Less than 1 percent of drivers who were legally impaired due to alcohol were recorded as driving properly at the time of the collision. The most frequently indicated improper driver action was loss of control of the vehicle.

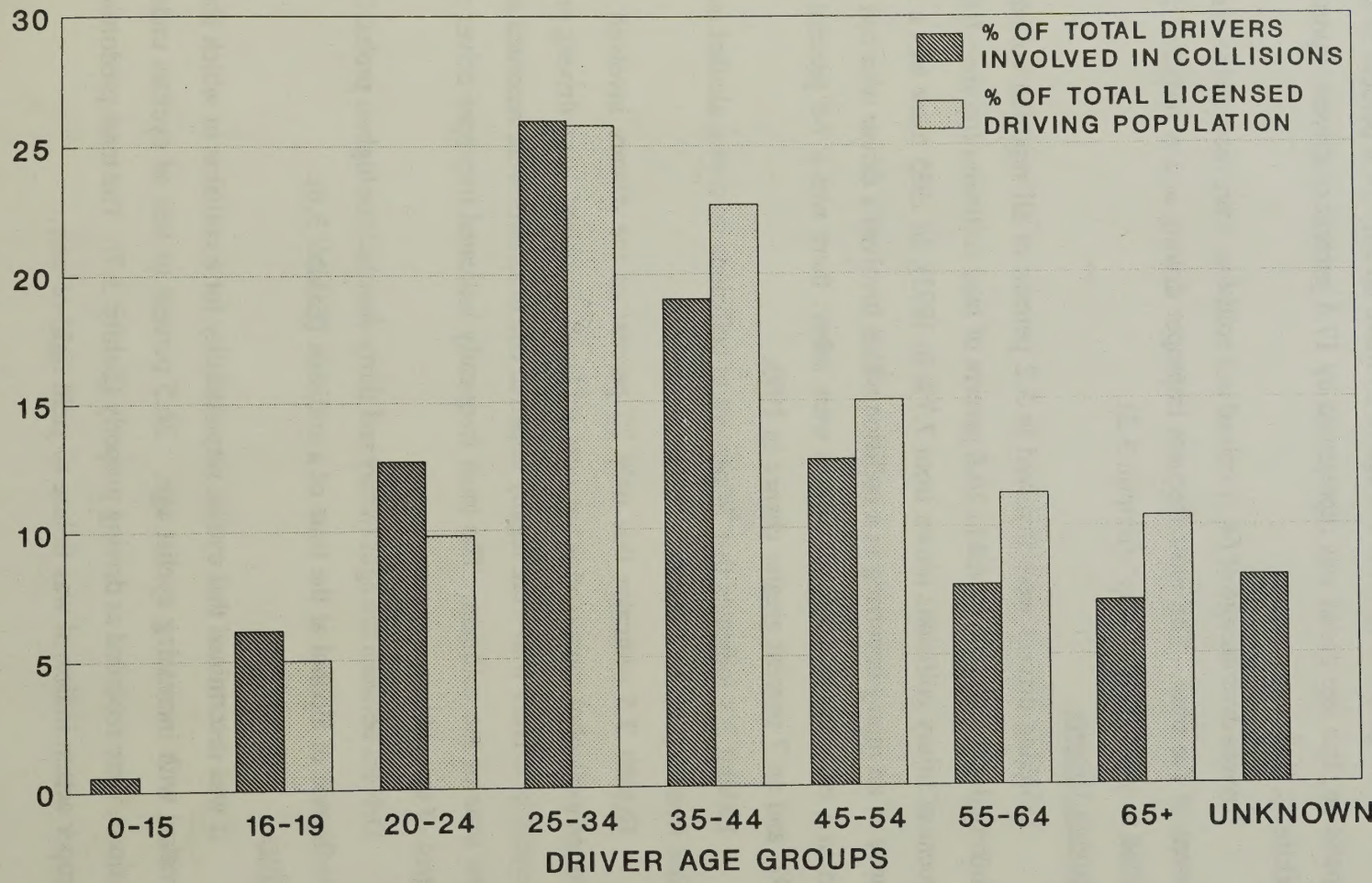
Drivers between the ages twenty and thirty-four had the highest probability of being under the influence of alcohol at the time of a collision (Exhibit 3.6).

Cyclists

It was determined that cyclist responsibility for a collision in which she/he was involved decreased with increasing cyclist age. 26.5 percent or less of cyclists under 19, involved in collisions, were recorded as driving properly (Exhibit 3.7). The most predominant known cyclist improper action indicated was failure to yield right-of-way.

Exhibit 3.1

MOTOR VEHICLE DRIVER AGE vs COLLISION INVOLVEMENT



DRIVERS UNDER 35 YEARS OF AGE ARE INVOLVED IN MORE COLLISIONS THAN EXPECTED BASED ON THE AGE DISTRIBUTUION OF THE LICENSED DRIVING POPULATION OF ONTARIO.

Exhibit 3.2

MOTOR VEHICLE DRIVER AGE vs DRIVER ACTION

DRIVER ACTION	DRIVER AGE 0–15	16–19	20–24	25–34	35–44	45–54	55–64	65–74	75+	TOTAL	% OF ALL ACTIONS
DRIVING PROPERLY	13	318	813	1913	1469	1025	563	290	94	6498	50.3%
FOLLOWING TOO CLOSE	1	101	197	382	234	119	72	58	28	1192	9.2%
EXCEEDING SPEED LIMIT	1	15	17	19	7	2	0	1	0	62	0.5%
SPEED TOO FAST	0	28	21	45	38	27	6	4	2	171	1.3%
SPEED TOO SLOW	0	0	0	0	0	0	1	0	0	1	0.0%
IMPROPER TURN	4	36	80	124	139	100	67	48	25	623	4.8%
DISOBEYED TRAFFIC CONTROL	8	58	106	193	116	64	64	57	25	691	5.4%
FAILED TO YIELD R.O.W.	24	117	194	365	233	184	157	127	64	1465	11.3%
IMPROPER PASSING	1	6	17	32	20	13	8	7	2	106	0.8%
LOST CONTROL	12	111	185	269	161	96	51	36	17	938	7.3%
WRONG WAY ON ONE-WAY	1	4	3	10	5	3	4	3	2	35	0.3%
IMPROPER LANE CHANGE	1	32	60	82	64	58	38	32	13	380	2.9%
OTHER	13	40	93	212	183	90	54	40	21	746	5.8%
TOTAL	79	524	1085	3646	2669	1781	1085	703	293	12908	100.0%
% DRIVERS INVOLVED DRIVING PROPERLY (a)	19.7%	65.7%	82.0%	55.7%	59.1%	60.6%	54.6%	43.7%	34.6%	53.4%	

THE OVERALL PERCENTAGE OF DRIVERS DRIVING PROPERLY WAS 53%.

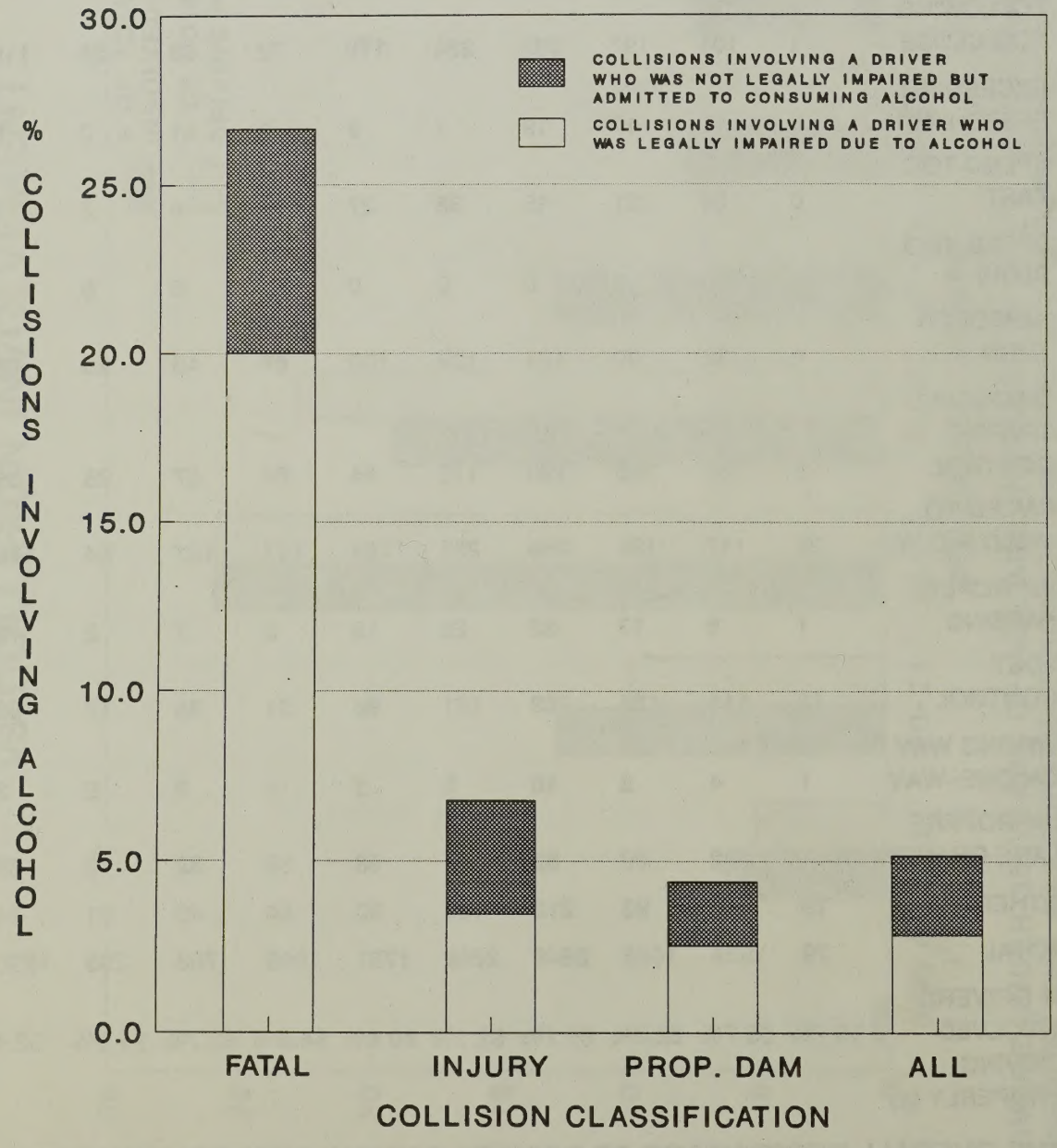
OLDER DRIVERS WERE LEAST LIKELY TO BE DRIVING PROPERLY.

THE MOST FREQUENTLY RECORDED IMPROPER DRIVING ACTION WAS FAILING TO YIELD RIGHT-OF-WAY.

(a) Excluding "Other".

Exhibit 3.3

ALCOHOL INVOLVEMENT vs COLLISION CLASSIFICATION



5.2% OF ALL COLLISIONS INVOLVED A DRIVER WHO HAD CONSUMED ALCOHOL.

Exhibit 3.4

COLLISIONS INVOLVING ALCOHOL vs TIME OF DAY AND DAY OF WEEK

	DAY OF WEEK							
TIME OF DAY	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL
12–1 a.m.	1	1	3	3	4	5	8	25
1–2 a.m.	5	2	4	6	8	17	7	49
2–3 a.m.	8	1	4	4	2	9	6	34
3–4 a.m.	0	0	1	2	2	4	6	15
4–5 a.m.	1	0	0	0	1	1	2	5
5–6 a.m.	0	1	0	0	3	4	0	8
6–7 a.m.	0	0	0	0	0	0	1	1
7–8 a.m.	1	0	2	0	1	1	1	6
8–9 a.m.	0	1	0	0	0	3	0	4
9–10 a.m.	2	1	0	0	0	0	1	4
10–11 a.m.	0	1	1	0	0	1	0	3
11–12 noon	0	0	0	0	1	1	4	6
12–1 p.m.	0	0	0	0	0	2	2	4
1–2 p.m.	0	0	0	1	1	0	1	3
2–3 p.m.	0	1	0	1	0	2	2	6
3–4 p.m.	2	0	1	3	0	2	1	9
4–5 p.m.	5	1	1	1	3	3	2	16
5–6 p.m.	1	1	0	1	2	5	2	12
6–7 p.m.	1	7	3	3	7	4	0	25
7–8 p.m.	1	2	0	4	9	6	7	29
8–9 p.m.	4	2	5	4	3	5	1	24
9–10 p.m.	2	3	1	8	4	6	6	30
10–11 p.m.	6	3	6	6	6	7	3	37
11–12 midnight	5	3	1	9	11	10	3	42
UNKNOWN	0	0	0	0	0	0	0	0
TOTAL	45	31	33	56	68	98	66	397

MOST COLLISIONS INVOLVING ALCOHOL OCCURRED IN THE EVENING FROM 6 p.m. TO 3 a.m.

Exhibit 3.5

DRIVER ACTION vs DRIVER CONDITION

DRIVER ACTION	NORMAL	HAD BEEN DRINKING (a)	IMPAIRED–ALCOHOL OVER .08 (b)	IMPAIRED–ALCOHOL (c)	IMPAIRED–DRUGS (d)
DRIVING PROPERLY	6212	38	1	1	1
FOLLOWING TOO CLOSE	973	9	13	9	1
EXCEEDING SPEED LIMIT	41	7	7	0	0
SPEED TOO FAST	143	8	4	2	0
SPEED TOO SLOW	1	0	0	0	0
IMPROPER TURN	546	7	5	2	0
DISOBEYED TRAFFIC CONTROL	563	13	16	10	0
FAILED TO YIELD R.O.W.	1284	13	7	1	0
IMPROPER PASSING	69	3	1	1	0
LOST CONTROL	639	63	75	20	4
WRONG WAY ON ONE–WAY	24	0	4	0	0
IMPROPER LANE CHANGE	322	7	3	0	0
OTHER	501	17	32	12	0
TOTAL	11318	185	168	58	6
% DRIVERS INVOLVED DRIVING PROPERLY (e)	57.4%	22.6%	0.7%	2.2%	16.7%

LESS THAN 23% OF DRIVERS WHO HAD BEEN DRINKING AND LESS THAN 3% OF DRIVERS WHO WERE IMPAIRED DUE TO ALCOHOL WERE RECORDED AS DRIVING PROPERLY AT THE TIME OF THE COLLISION.

(a) Driver had consumed alcohol but their physical condition was not legally impaired.
(b) Driver had consumed alcohol and upon testing was found to have a blood–alcohol level in excess of 80 mg.

DRIVER CONDITION

FATIGUE	MEDICAL DISABILITY	INATTENTIVE	UNKNOWN	OTHER	TOTAL	%
0	5	13	326	1	6598	48.6%
1	2	44	196	0	1248	9.2%
0	0	1	11	2	69	0.5%
0	0	5	26	0	188	1.4%
0	0	0	1	0	2	0.0%
0	2	17	73	1	653	4.8%
2	1	37	95	4	741	5.5%
0	3	46	186	1	1541	11.4%
0	0	2	47	0	123	0.9%
10	15	29	195	6	1056	7.8%
0	0	1	10	0	39	0.3%
1	0	9	82	1	425	3.1%
5	4	31	266	13	881	6.5%
19	32	235	1514	29	13564	100.0%
0.0%	17.9%	6.4%	26.1%	6.3%	52.0%	

(c) Driver had consumed sufficient alcohol to warrant being charged with a drinking and driving offence in the judgement of the investigating officer.

(d) Driver had used drugs and was legally impaired in the judgement of the investigating officer.

(e) Excluding not known and other.

Exhibit 3.6

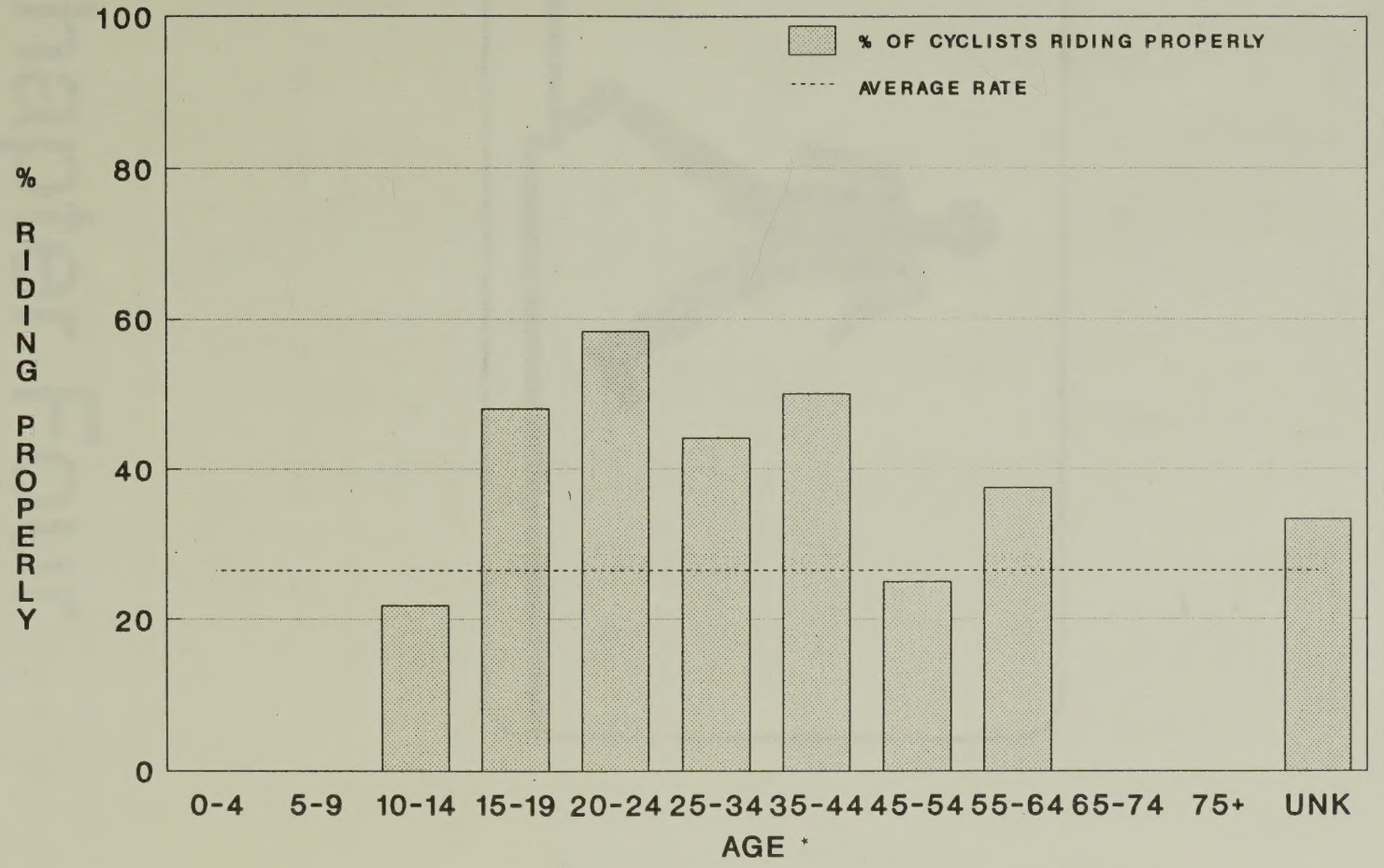
DRIVER AGE vs DRIVER CONDITION

DRIVER CONDITION	DRIVER AGE 0–15	16–19	20–24	25–34	35–44	45–54	55–64	65–74	75+	NO DRIVER	UNKNOWN	TOTAL	%
NORMAL	54	756	1534	3084	2320	1592	966	594	248	1	177	11326	83.2%
HAD BEEN DRINKING	1	5	40	70	27	19	8	7	1	0	8	186	1.4%
IMPAIRED–ALCOHOL OVER .08	0	3	20	63	36	25	12	7	1	0	1	168	1.2%
IMPAIRED–ALCOHOL	0	2	6	14	20	8	4	2	1	0	1	58	0.4%
IMPAIRED–DRUGS	0	0	0	2	3	1	0	0	0	0	0	6	0.0%
FATIGUE	0	1	6	6	3	0	0	0	1	0	2	19	0.1%
MEDICAL DISABILITY	0	1	0	7	6	4	3	5	6	0	0	32	0.2%
INATTENTIVE	14	20	35	65	30	25	15	19	10	0	2	235	1.7%
NOT KNOWN	10	73	144	331	219	103	76	67	21	0	502	1546	11.4%
OTHER	0	5	1	4	6	3	1	2	4	0	4	30	0.2%
TOTAL	79	866	1786	3646	2670	1780	1085	703	293	1	697	13606	100.0%
% DRINKING DRIVERS INVOLVED (a)	1.4%	1.3%	4.0%	4.4%	3.4%	3.1%	2.4%	2.5%	1.1%	0.0%	5.2%		

DRIVERS IN THE AGE GROUP 20 TO 44 WERE MOST LIKELY TO HAVE CONSUMED ALCOHOL BEFORE BEING INVOLVED IN A COLLISION.

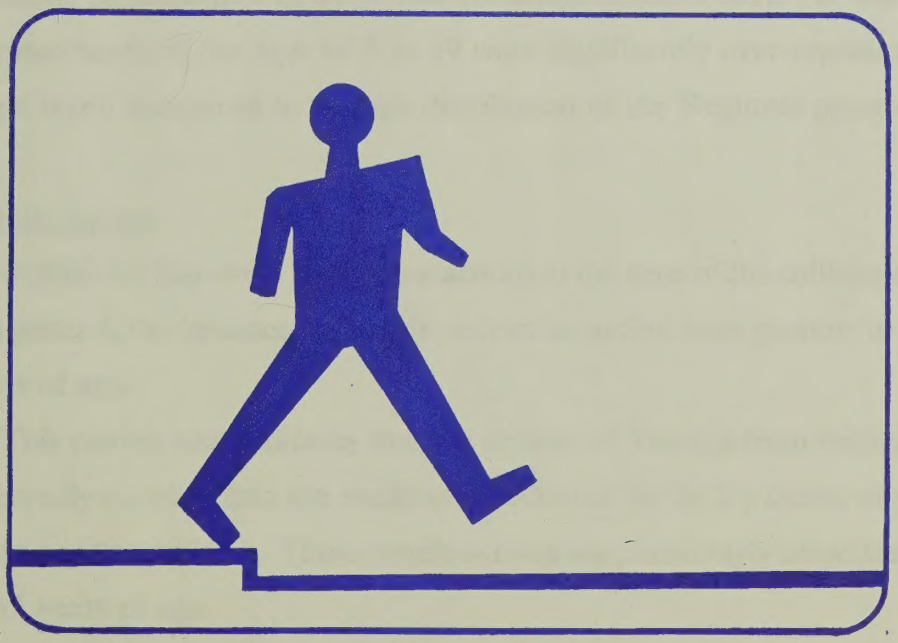
(a) Excluding not known and other.

Exhibit 3.7 CYCLIST ACTIONS IN MOTOR VEHICLE COLLISIONS: PERCENTAGE RIDING PROPERLY vs AGE GROUP



THE 10 TO 14 YEAR OLD AGE GROUP HAD THE POOREST RIDING PERFORMANCE.

*No cyclists were recorded in the 0-4 & 65-74 age groups. Very few involved cyclists were over the age of 44.



Chapter Four
Pedestrians

Chapter Four
Pedestrians

Chapter 4

General

In 1993, there were 306 pedestrian collisions (Exhibit 1.6) resulting in 290 pedestrian injuries and 4 pedestrians fatalities (12 pedestrians were involved in a collision but were not hurt).

Age

The relationship between the Regional population distribution and pedestrian involvement in collisions in 1993 was reviewed (Exhibit 4.1). It was determined that pedestrians between the ages of 5 to 19 were significantly over-represented in pedestrian collisions when compared to the age distribution of the Regional population.

Pedestrian Action

Exhibit 4.2 shows the pedestrian actions at the time of the collisions versus pedestrian age. In general, the instances of unsafe pedestrian action were greater for pedestrians under 5-9 years of age.

This exhibit also indicates that the actions of "coming from behind a parked car" or "unexpectedly running into the roadway" accounted for 24.2 percent of pedestrian actions at the time of the collision. These unsafe actions are particularly associated with pedestrians under 15 years of age.

43 percent of all pedestrian collisions indicate that the pedestrian was involved in an unsafe action (e.g. coming from behind a parked vehicle).

Examination of the data for pedestrian collisions at traffic signals indicates that in 69% of cases, the pedestrian was not at fault (Exhibit 4.3).

Time of Collisions

The time of day when collisions occurred was compared to the number of pedestrians injured (Exhibit 4.4). It was determined that 11.7 percent of pedestrians were injured in collisions which occurred between 3 p.m. and 4 p.m. Exhibit 4.5 compares the time of day of pedestrian collisions with pedestrian age. 33 pedestrians between the ages 5 to 14 were involved in pedestrian collisions which occurred at school crossing times.* This represents 10.7 percent of the 306 pedestrians involved in collisions in 1993.

* School crossing times: 8:00 a.m. - 9:00 a.m., 12 noon - 1:30 p.m. 3:30 p.m. - 4:45 p.m., Monday - Friday; excluding July and August.

Pedestrian Condition

In most cases, the condition of the pedestrian (Exhibit 4.6) involved in the collision was reported as normal (65% of the time). However, in 10.2 percent of the collisions involving pedestrians, the pedestrian admitted to alcohol consumption or was legally impaired.

Location

Exhibit 4.7 examines the type of traffic control at locations where pedestrian collisions occurred. In 43 percent of the pedestrian collisions, the collision occurred at a non-intersection location with no control, 31% at a traffic signal controlled intersection, and 19 percent at a stop sign controlled intersection.

Driver Action

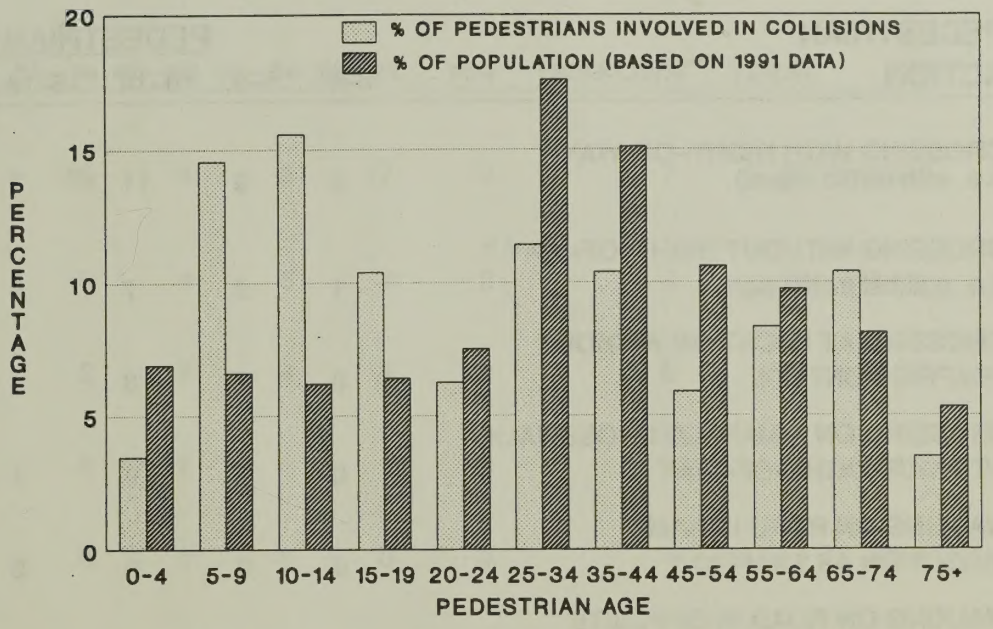
Exhibit 4.8 indicates that in 66 percent of the motor vehicle/pedestrian collisions, the driver was recorded as driving properly. This figure does not necessarily suggest that the drivers involved in these collisions were totally without blame but does indicate that a majority of pedestrian collisions are associated with improper pedestrian action or lack of awareness of traffic conditions at the time of the collision.

Of the 34 percent of motor vehicle/pedestrian collisions in which the driver was not driving properly, the most frequently recorded driver action was "failing to yield the right-of-way" (associated with 16.6% of all motor vehicle - pedestrian collisions).

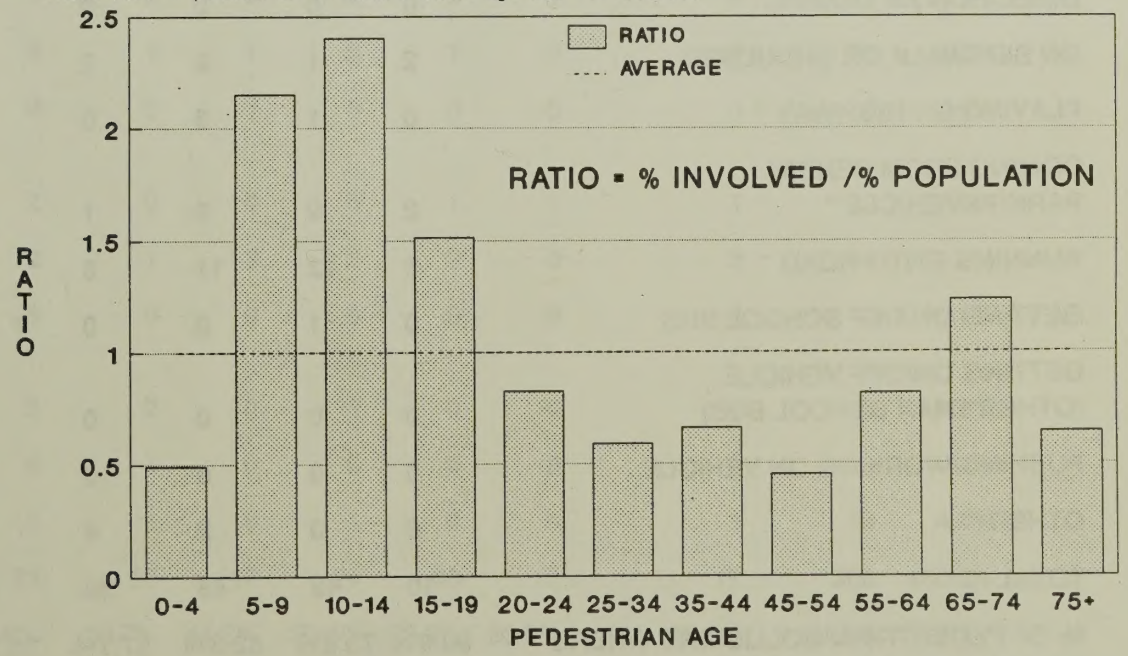
Pedestrian Injuries

Most pedestrians (87%) suffered no, minimal or minor injuries when involved in a collision.

Exhibit 4.1 PEDESTRIAN AGE vs COLLISION INVOLVEMENT



• There were 17 pedestrian collisions where age was not recorded



PEDESTRIANS FROM 5 TO 19 YEARS OLD ARE SIGNIFICANTLY OVER-REPRESENTED IN PEDESTRIAN COLLISIONS BASED ON THE AGE DISTRIBUTION OF POPULATION OF HAMILTON-WENTWORTH.

Exhibit 4.2

PEDESTRIAN AGE vs PEDESTRIAN ACTION (ALL LOCATIONS)

PEDESTRIAN ACTION	PEDESTRIAN AGE 0–4	5–9	10–14	15–19	20–24
CROSSING WITH RIGHT-OF-WAY (i.e. with traffic signal)	2	6	11	7	2
CROSSING WITHOUT RIGHT-OF-WAY * (i.e. against traffic signal)	1	9	7	8	4
CROSSING AT LOCATION WITHOUT TRAFFIC CONTROL	0	2	3	1	2
CROSSING ON A MARKED CROSSWALK, WITHOUT RIGHT-OF-WAY	0	1	0	1	2
WALKING ON ROAD IN SAME DIRECTION AS TRAFFIC *	0	0	0	0	0
WALKING ON ROAD IN OPPOSITE DIRECTION AS TRAFFIC	0	0	0	0	0
ON SIDEWALK OR SHOULDER	2	1	2	2	1
PLAYING ON HIGHWAY *	0	1	3	0	1
COMING FROM BEHIND PARKED VEHICLE *	2	9	6	1	0
RUNNING ONTO ROAD *	3	12	11	6	1
GETTING ON/OFF SCHOOL BUS	0	1	0	0	1
GETTING ON/OFF VEHICLE (OTHER THAN SCHOOL BUS)	0	0	0	0	3
PUSHING/WORKING ON VEHICLE	0	0	0	0	0
OTHER	0	0	2	4	1
TOTAL	10	42	45	30	18
% OF PEDESTRIAN COLLISIONS WHERE PEDESTRIAN IS INVOLVED IN AN UNSAFE ACTION (EXCLUDING OTHER)	60.0%	73.8%	62.8%	57.7%	35.3%

THE INSTANCES OF UNSAFE PEDESTRIAN ACTIONS WERE HIGHEST FOR THE 5–9 YEAR OLD GROUP.

* Actions considered unsafe

25–34	35–44	45–54	55–64	65–74	75+	UNKNOWN	TOTAL	%
7	16	4	8	17	3	7	90	29.4%
3	5	4	6	4	2	3	56	18.3%
3	2	3	4	4	3	0	27	8.8%
4	0	2	1	1	0	0	12	3.9%
1	0	0	0	0	0	1	2	0.7%
1	0	0	0	0	1	0	2	0.7%
6	4	1	3	1	0	0	23	7.5%
0	0	1	0	0	0	0	6	2.0%
2	0	0	0	1	1	1	23	7.5%
2	1	2	1	2	0	3	44	14.4%
0	0	0	0	0	0	0	2	0.7%
0	0	0	0	0	0	1	4	1.3%
0	1	0	0	0	0	0	1	0.3%
4	1	0	1	0	0	1	14	4.6%
33	30	17	24	30	10	17	306	100.0%
27.6%	20.7%	41.2%	30.4%	23.3%	30.0%	50.0%	44.9%	

22% OF PEDESTRIANS INVOLVED IN COLLISIONS ENTERED THE ROADWAY UNEXPECTEDLY (CAME FROM BEHIND PARKED CARS OR RAN INTO THE ROADWAY).

Exhibit 4.3

PEDESTRIAN AGE vs PEDESTRIAN ACTION (AT TRAFFIC SIGNALS)

PEDESTRIAN ACTION	PEDESTRIAN AGE 0–4	5–9	10–14	15–19	20–24	25–34
CROSSING WITH RIGHT-OF-WAY (i.e. with traffic signal)	1	3	9	4	1	3
CROSSING WITHOUT RIGHT-OF-WAY * (i.e. against traffic signal)	0	3	3	4	3	1
CROSSING AT LOCATION WITHOUT TRAFFIC CONTROL	0	0	0	1	0	0
CROSSING ON A MARKED CROSSWALK, WITHOUT RIGHT-OF-WAY	0	1	0	1	2	3
WALKING ON ROAD IN THE SAME DIRECTION AS TRAFFIC *	0	0	0	0	0	1
WALKING ON ROAD IN OPPOSITE DIRECTION AS TRAFFIC	0	0	0	0	0	0
ON SIDEWALK OR SHOULDER	1	0	0	0	0	1
PLAYING ON HIGHWAY *	0	0	0	0	1	0
COMING FROM BEHIND PARKED VEHICLE *	0	0	0	0	0	0
RUNNING ONTO ROAD *	0	2	0	0	0	0
GETTING ON/OFF VEHICLE (OTHER THAN SCHOOL BUS)	0	0	0	0	0	0
PUSHING/WORKING ON VEHICLE	0	0	0	0	0	0
OTHER	0	0	1	1	0	0
TOTAL	2	9	13	11	7	9
% OF PEDESTRIAN COLLISIONS WHERE PEDESTRIAN IS INVOLVED IN AN UNSAFE ACTION (EXCLUDING OTHER)	0.0%	55.6%	23.1%	36.4%	57.1%	22.2%

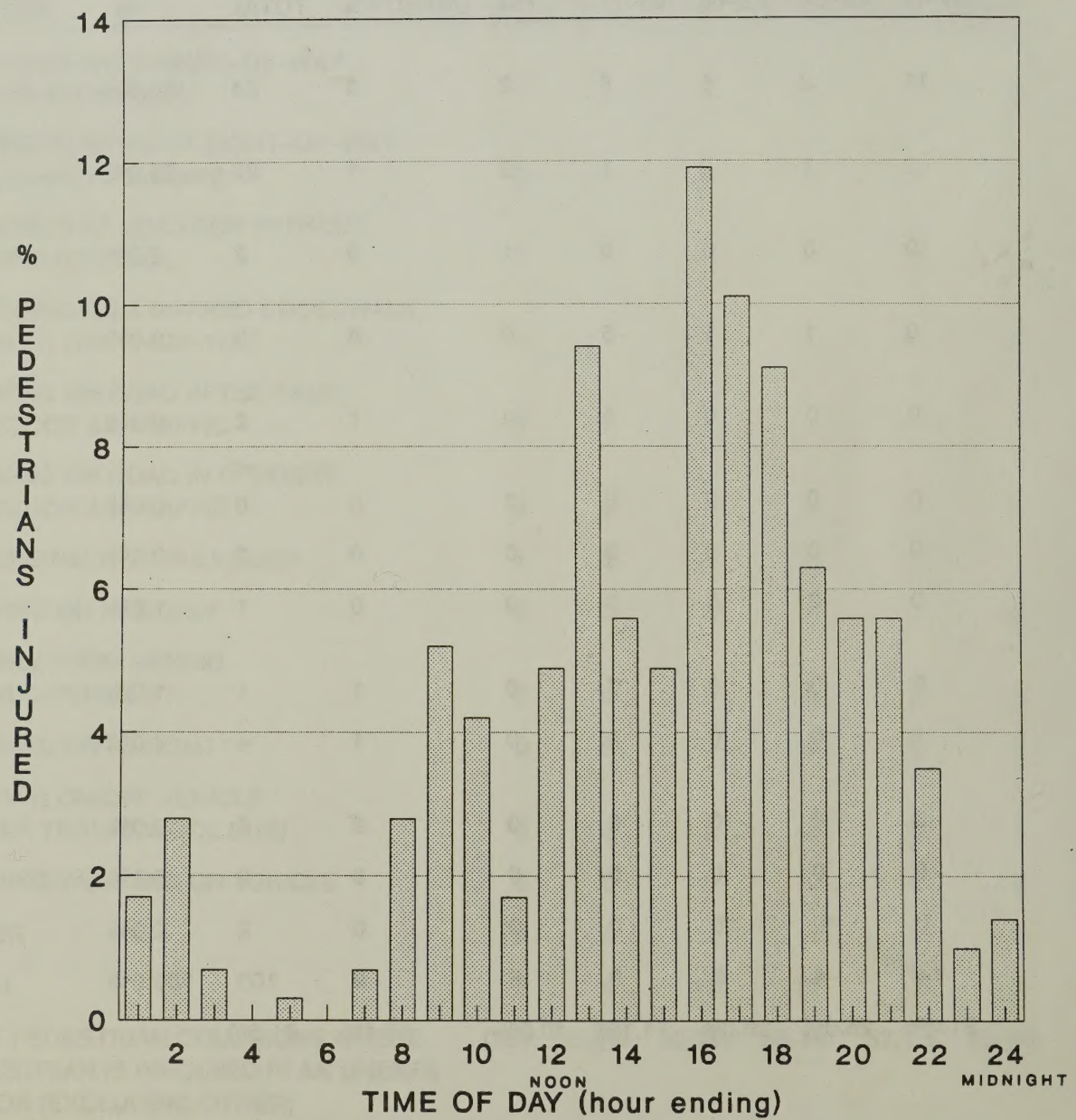
PEDESTRIANS BETWEEN THE AGES OF 5 AND 9 WERE MORE LIKELY THAN OTHER AGE GROUPS TO BE INVOLVED IN COLLISIONS WHICH OCCURRED AT TRAFFIC SIGNALS DUE TO UNSAFE ACTIONS.

* Actions considered unsafe

35–44	45–54	55–64	65–74	75+	UNKNOWN	TOTAL	%
11	2	5	8	2	5	54	54.0%
2	1	2	1	2	1	23	23.0%
0	0	0	0	1	0	2	2.0%
0	1	1	0	0	0	9	9.0%
0	0	0	0	0	1	2	2.0%
0	0	0	0	0	0	0	0.0%
0	0	0	0	0	0	2	2.0%
0	0	0	0	0	0	1	1.0%
0	0	0	0	0	1	1	1.0%
1	0	0	0	0	1	4	4.0%
0	0	0	0	0	0	0	0.0%
0	0	0	0	0	0	0	0.0%
0	0	0	0	0	0	2	2.0%
14	4	8	9	5	9	100	100.0%
21.4%	25.0%	25.0%	11.1%	40.0%	44.4%	31.0%	

Exhibit 4.4

TIME OF DAY vs NUMBER OF PEDESTRIANS INJURED



THE HIGHEST NUMBER OF PEDESTRIAN COLLISIONS OCCURRED BETWEEN THE HOURS OF 3 p.m. - 4 p.m.

Exhibit 4.5

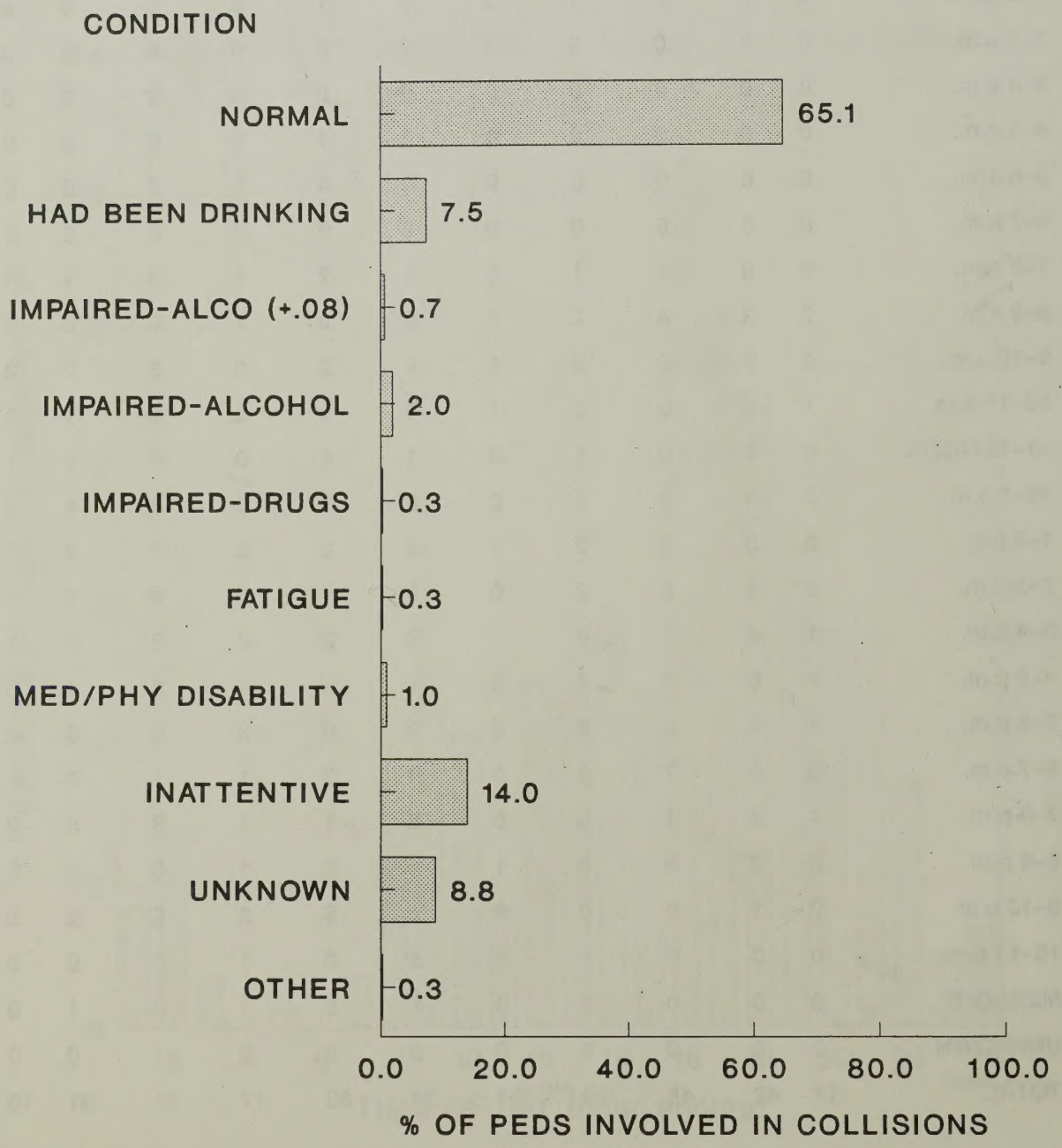
TIME OF DAY vs PEDESTRIAN AGE

	PEDESTRIAN AGE												
TIME OF DAY	0–4	5–9	10–14	15–19	20–24	25–34	35–44	45–54	55–64	65–74	75+	U/K	TOTAL
12–1 a.m.	0	0	0	2	2	0	1	0	0	0	0	0	5
1–2 a.m.	0	0	0	1	3	3	1	0	0	0	0	1	8
2–3 a.m.	0	0	0	0	0	2	0	0	0	0	0	0	2
3–4 a.m.	0	0	0	0	0	0	0	0	0	0	0	0	0
4–5 a.m.	0	0	0	0	0	0	1	0	0	0	0	0	1
5–6 a.m.	0	0	0	0	0	0	0	0	0	0	0	0	0
6–7 a.m.	0	0	0	0	0	2	0	0	0	0	0	0	2
7–8 a.m.	0	0	1	1	0	1	2	1	0	1	0	1	7
8–9 a.m.	2	3	4	2	1	0	2	1	0	0	0	1	15
9–10 a.m.	0	0	0	0	1	4	2	0	3	0	2	1	12
10–11 a.m.	1	2	0	0	1	0	0	0	1	1	0	0	6
11–12 NOON	0	2	0	1	0	1	3	0	0	5	1	1	13
12–1 p.m.	2	4	6	1	0	6	3	0	3	4	0	2	29
1–2 p.m.	0	0	0	2	1	4	2	2	2	2	1	0	16
2–3 p.m.	2	1	0	2	0	0	1	0	4	3	2	0	15
3–4 p.m.	1	8	11	6	1	2	2	2	2	0	1	0	36
4–5 p.m.	1	6	7	2	3	1	1	1	2	4	0	1	28
5–6 p.m.	1	6	5	2	3	0	0	3	0	3	2	2	25
6–7 p.m.	0	3	7	2	1	0	3	1	1	0	1	1	19
7–8 p.m.	1	4	1	0	0	2	1	1	3	4	0	1	17
8–9 p.m.	0	2	3	2	1	1	2	1	0	1	0	3	13
9–10 p.m.	0	1	0	0	0	1	3	2	2	2	0	1	11
10–11 p.m.	0	0	0	1	0	3	0	1	0	0	0	1	5
MIDNIGHT	0	0	0	2	0	1	0	1	0	1	0	0	5
UNKNOWN	0	0	0	0	0	0	0	0	1	0	0	0	1
TOTAL	11	42	45	29	18	34	30	17	24	31	10	17	308

20% OF PEDESTRIANS WERE INVOLVED IN COLLISIONS THAT OCCURRED BETWEEN THE HOURS OF 3 p.m. – 5 p.m.

Exhibit 4.6

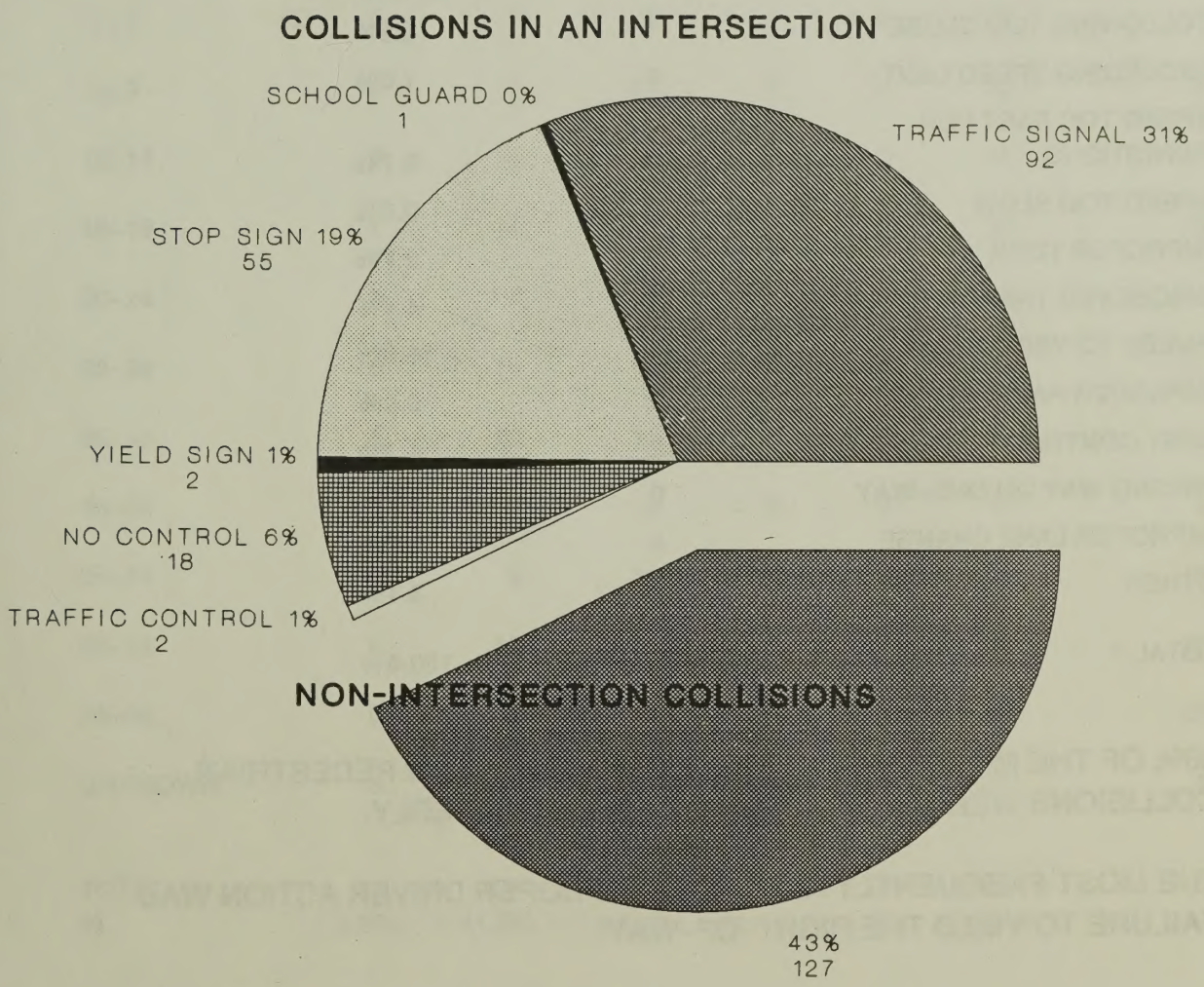
CONDITION OF PEDESTRIANS INVOLVED IN COLLISIONS



10.2% OF PEDESTRIANS INVOLVED IN COLLISIONS HAD CONSUMED ALCOHOL.

Exhibit 4.7

TYPE OF TRAFFIC CONTROL AT LOCATIONS WHERE PEDESTRIAN COLLISIONS OCCURRED



ABOUT ONE HALF OF COLLISIONS AT INTERSECTIONS WITH STOP SIGNS OCCURRED WHILE PEDESTRIAN WAS CROSSING A LEG OF THE INTERSECTION CONTROLLED BY A STOP SIGN. THUS, ABOUT 41% OF ALL PEDESTRIAN COLLISIONS OCCURED UNDER CONDITIONS WHERE THE PEDESTRIAN SHOULD HAVE HAD RIGHT-OF-WAY.

Exhibit 4.8

DRIVER ACTION IN PEDESTRIAN COLLISIONS

ACTION	NUMBER OF DRIVERS INVOLVED	PERCENTAGE
DRIVING PROPERLY	196	66.2%
FOLLOWING TOO CLOSE	1	0.3%
EXCEEDING SPEED LIMIT	3	1.0%
SPEED TOO FAST FOR CONDITIONS	2	0.7%
SPEED TOO SLOW	0	0.0%
IMPROPER TURN	8	2.7%
DISOBEYED TRAFFIC CONTROL	13	4.4%
FAILED TO YIELD R.O.W.	49	16.6%
IMPROPER PASSING	0	0.0%
LOST CONTROL	12	4.1%
WRONG WAY ON ONE-WAY	0	0.0%
IMPROPER LANE CHANGE	0	0.0%
OTHER	12	4.1%
TOTAL *	296	100.0%

66% OF THE MOTOR VEHICLE DRIVERS INVOLVED IN PEDESTRIAN COLLISIONS WERE RECORDED AS DRIVING PROPERLY.

THE MOST FREQUENTLY RECORDED IMPROPER DRIVER ACTION WAS FAILURE TO YIELD THE RIGHT-OF-WAY.

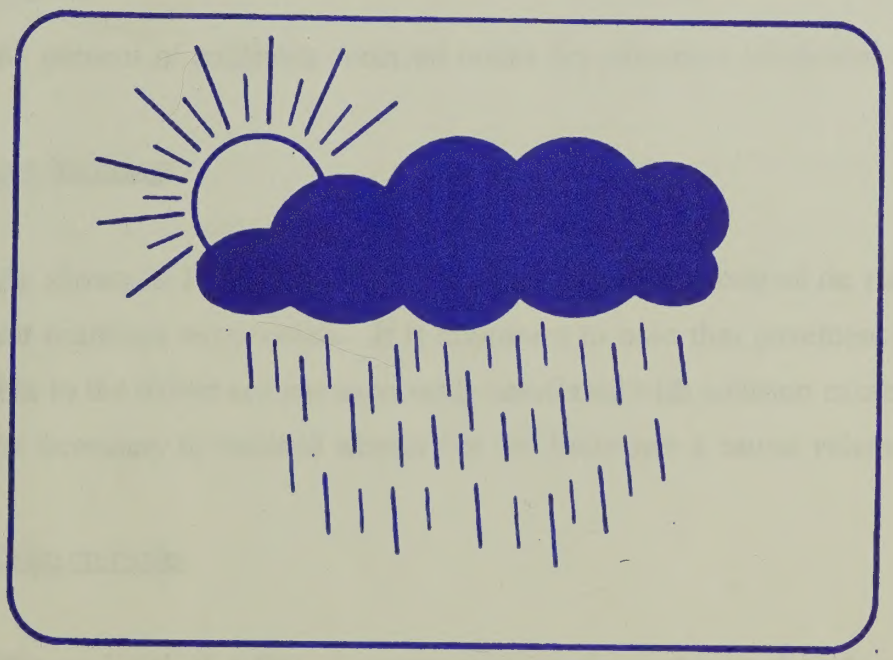
* Pedestrian collisions involved more than one driver or vehicle in some cases. Data not available on driver action in 7 cases.

Exhibit 4.9

PEDESTRIAN AGE vs INJURY STATUS

PEDESTRIAN AGE	STATUS OF INJURY						% MAJOR OR FATAL INJURY
	NONE	MINIMAL	MINOR	MAJOR	FATAL	TOTAL	
0–4	0	7	2	1	0	10	10.0%
5–9	2	17	20	3	0	42	7.1%
10–14	2	16	22	5	0	45	11.1%
15–19	1	11	14	4	0	30	13.3%
20–24	0	7	7	4	0	18	22.2%
25–34	0	14	15	3	1	33	12.1%
35–44	1	13	13	3	0	30	10.0%
45–54	1	8	8	0	0	17	0.0%
55–64	0	9	11	2	2	24	16.7%
65–74	0	13	9	8	0	30	26.7%
75–98	0	2	6	1	1	10	20.0%
UNKNOWN	5	10	1	1	0	17	5.9%
TOTAL	12	127	128	35	4	306	12.7%
%	3.9%	41.5%	41.8%	11.4%	1.3%	100.0%	

OF ALL PEDESTRIANS INVOLVED IN COLLISONS, 87% SUFFERED NO INJURY OR ONLY MINIMAL OR MINOR INJURIES.



Chapter Five
Environment

Chapter Five
Environment

Chapter 5

Weather and Light Conditions

Exhibit 5.1 indicates that most collisions occurred during clear weather conditions and under daylight conditions.

Road Surface

68 percent of collisions occurred under dry pavement conditions (Exhibit 5.2).

Pavement Markings

As shown in Exhibit 5.3, 84 percent of collisions occurred on roadways where the pavement markings were visible. It is important to note that pavement markings that are not visible to the driver are not necessarily associated with collision cause. Further analysis would be necessary to indicate whether or not there was a causal relationship.

Road Characteristics

The majority of collisions occurred at locations with straight, level geometrics (Exhibit 5.4). Exhibit 5.5 shows that most collisions (both non-intersection and intersection) occurred on two-way, undivided roads.

Normalizing data such as the percentages of various categories of intersections and the traffic volumes passing through those intersections is not presently available, therefore it is not possible to state that one intersection type is less prone to collision occurrence than another. However, the reader is referred to Exhibit 6.2 and Exhibit 6.3 which rank intersections by the number of collisions and rate of collision occurrence.

Road Location

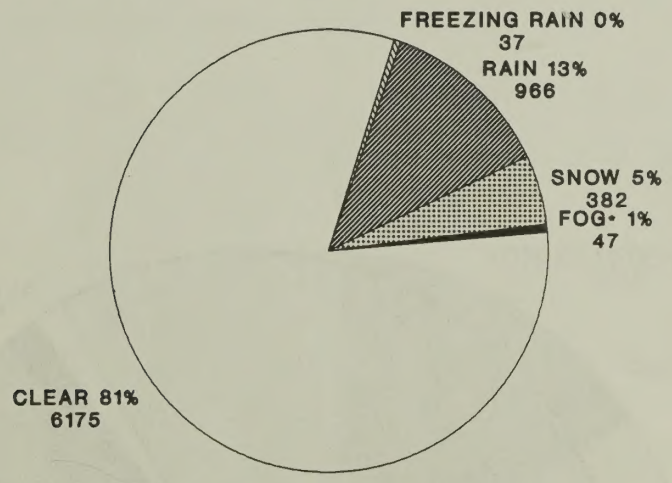
Exhibit 5.6 indicates that the greatest number of collisions occurred at non-intersection locations. If collisions occurring near or at intersections are combined, there were a greater number of collisions directly or indirectly related to intersections. As the exposure to vehicle conflicts is inherently greater at intersection locations, this result is not unexpected.

Fixed Objects

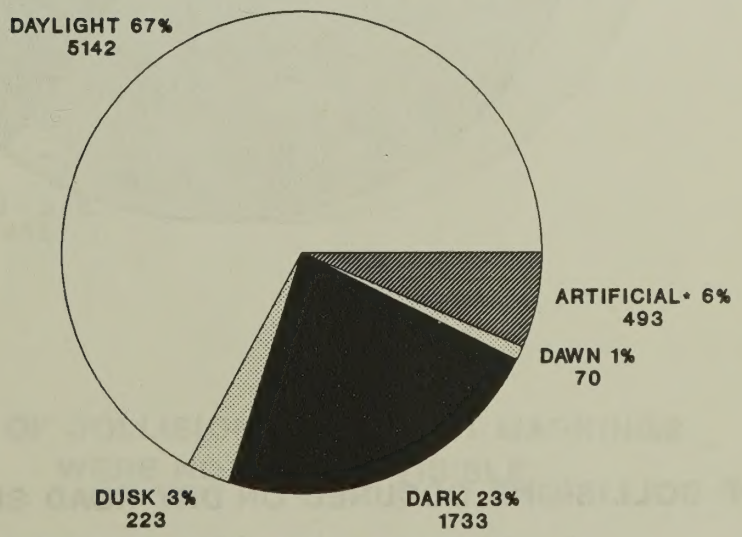
There were 860 recorded cases where vehicles struck fixed objects adjacent to the road (Exhibit 5.7). 334 drivers struck utility poles or poles supporting signs, the next most common object hit was a curb (165). In 1992 there were only 951 cases overall of a vehicle striking a fixed object.

Exhibit 5.1

WEATHER AND LIGHT CONDITIONS IN MOTOR VEHICLE COLLISIONS



• INCLUDES FOG, MIST, SMOKE AND DUST

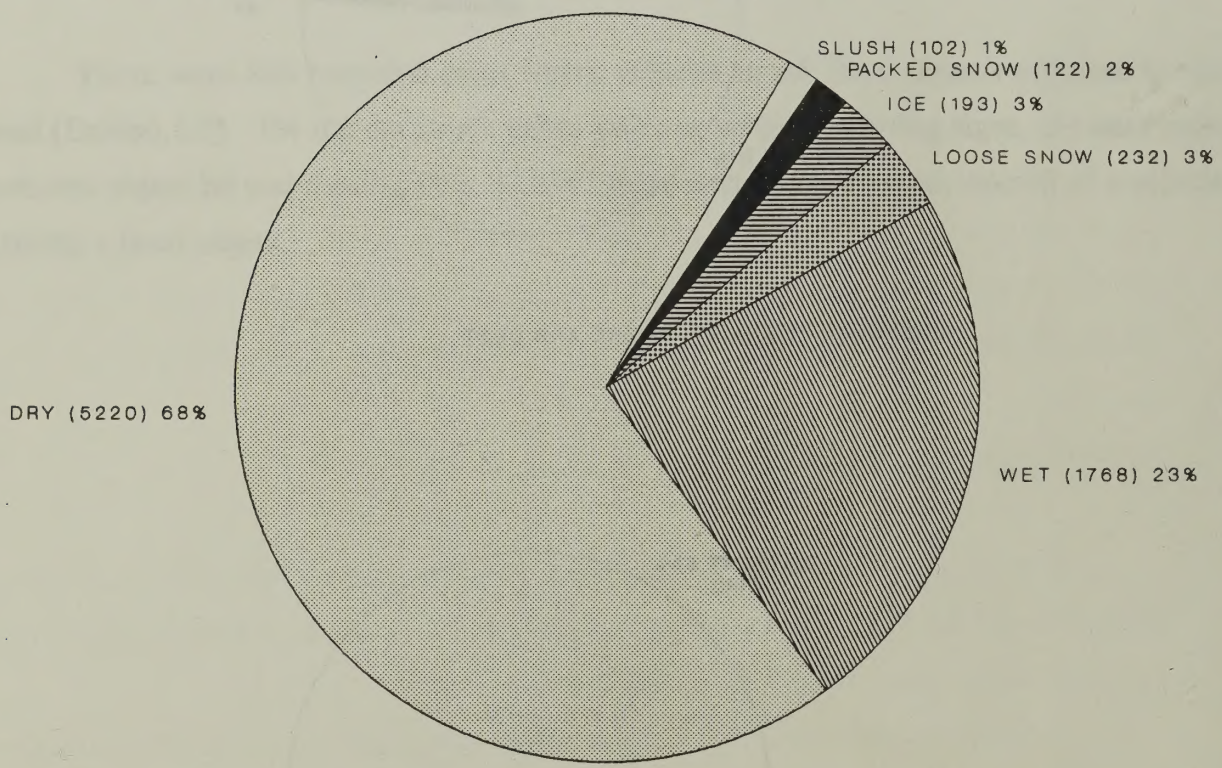


• INCLUDES ARTIFICIAL DAYLIGHT, DAWN, DUSK AND DARK

80% OF COLLISIONS OCCURRED DURING CLEAR WEATHER.
67% OF COLLISIONS OCCURRED IN DAYLIGHT.

Exhibit 5.2

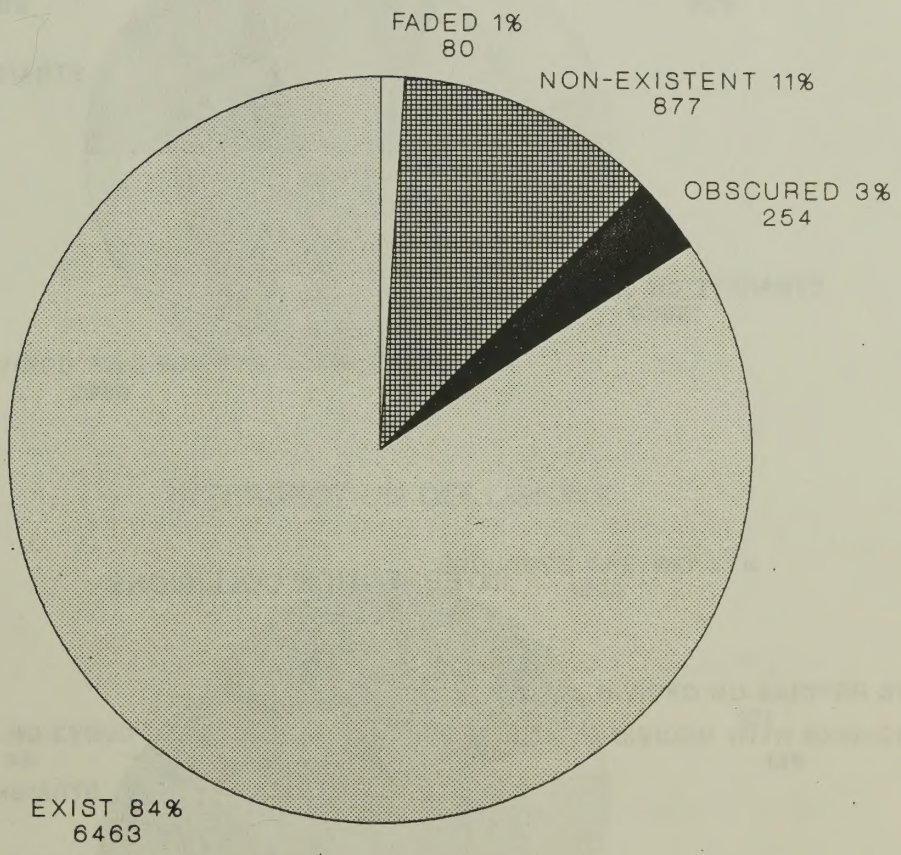
ROAD SURFACE CONDITIONS IN MOTOR VEHICLE COLLISIONS



68% OF COLLISIONS OCCURED ON DRY ROAD SURFACES.

Exhibit 5.3

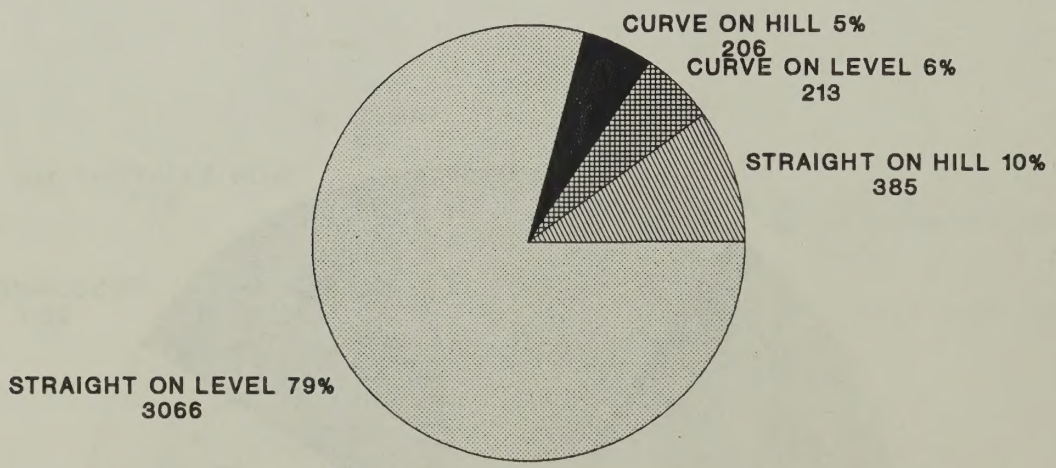
PAVEMENT MARKINGS IN MOTOR VEHICLE COLLISIONS



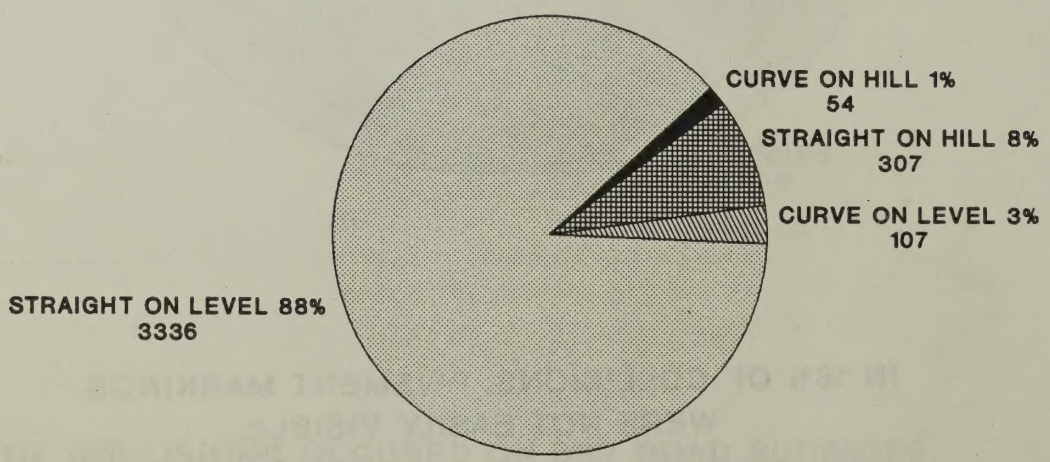
IN 16% OF COLLISIONS, PAVEMENT MARKINGS WERE NOT EASILY VISIBLE.

Exhibit 5.4 ROAD ALIGNMENT IN MOTOR VEHICLE COLLISIONS

NON-INTERSECTION COLLISIONS



INTERSECTION COLLISIONS

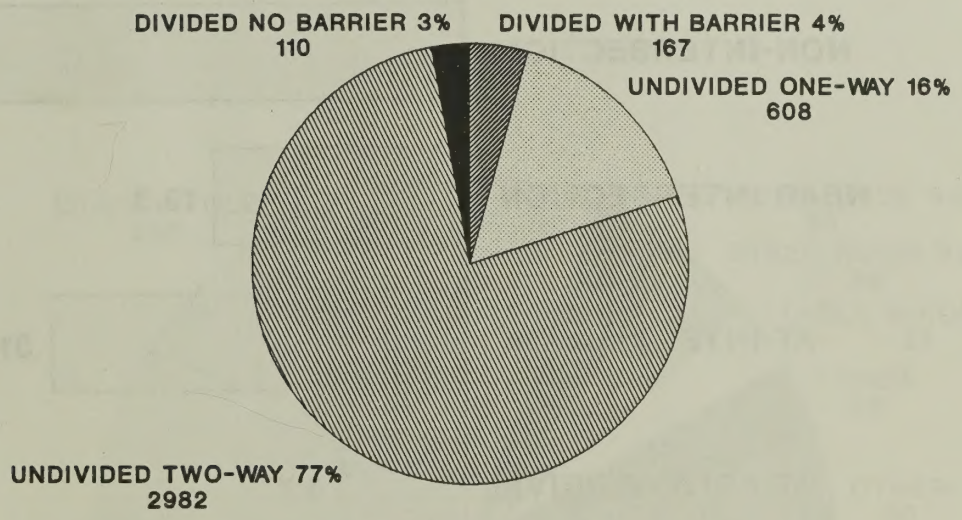


MOST COLLISIONS OCCURRED AT LOCATIONS WITH STRAIGHT, LEVEL GEOMETRICS.

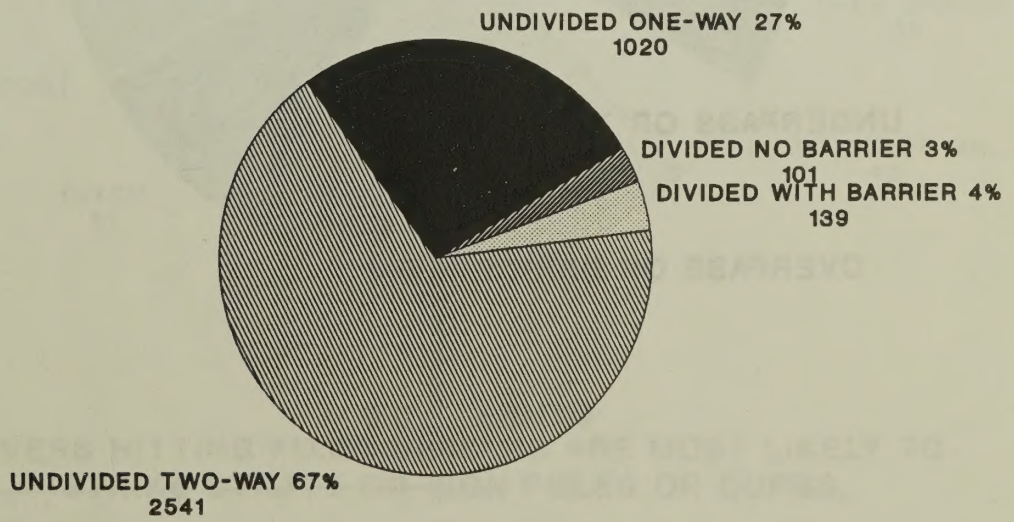
ENVIRONMENT

Exhibit 5.5 ROAD CHARACTERISTICS IN MOTOR VEHICLE COLLISIONS

NON-INTERSECTION COLLISIONS

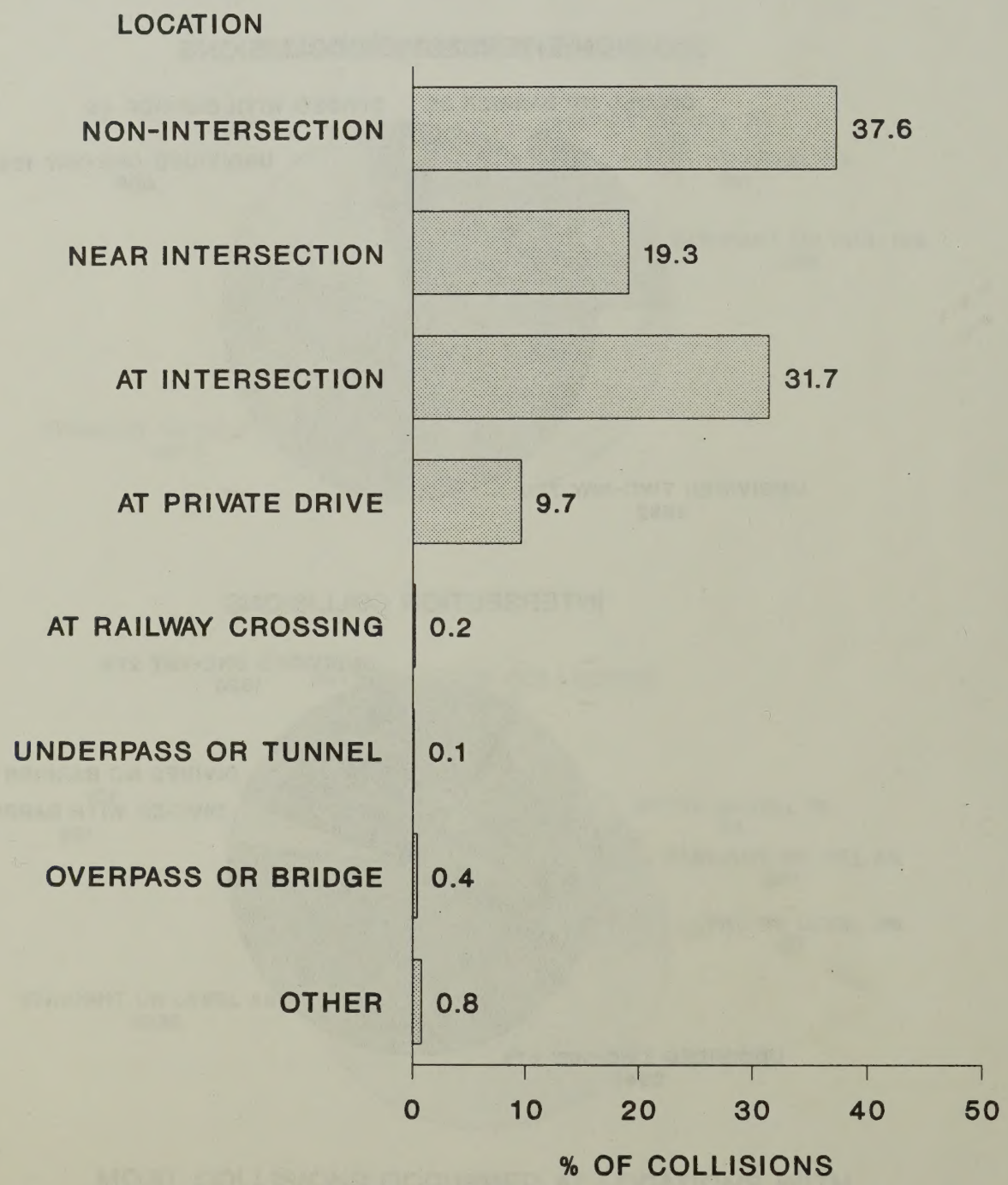


INTERSECTION COLLISIONS



MOST COLLISIONS OCCURRED ON UNDIVIDED TWO WAY ROADS

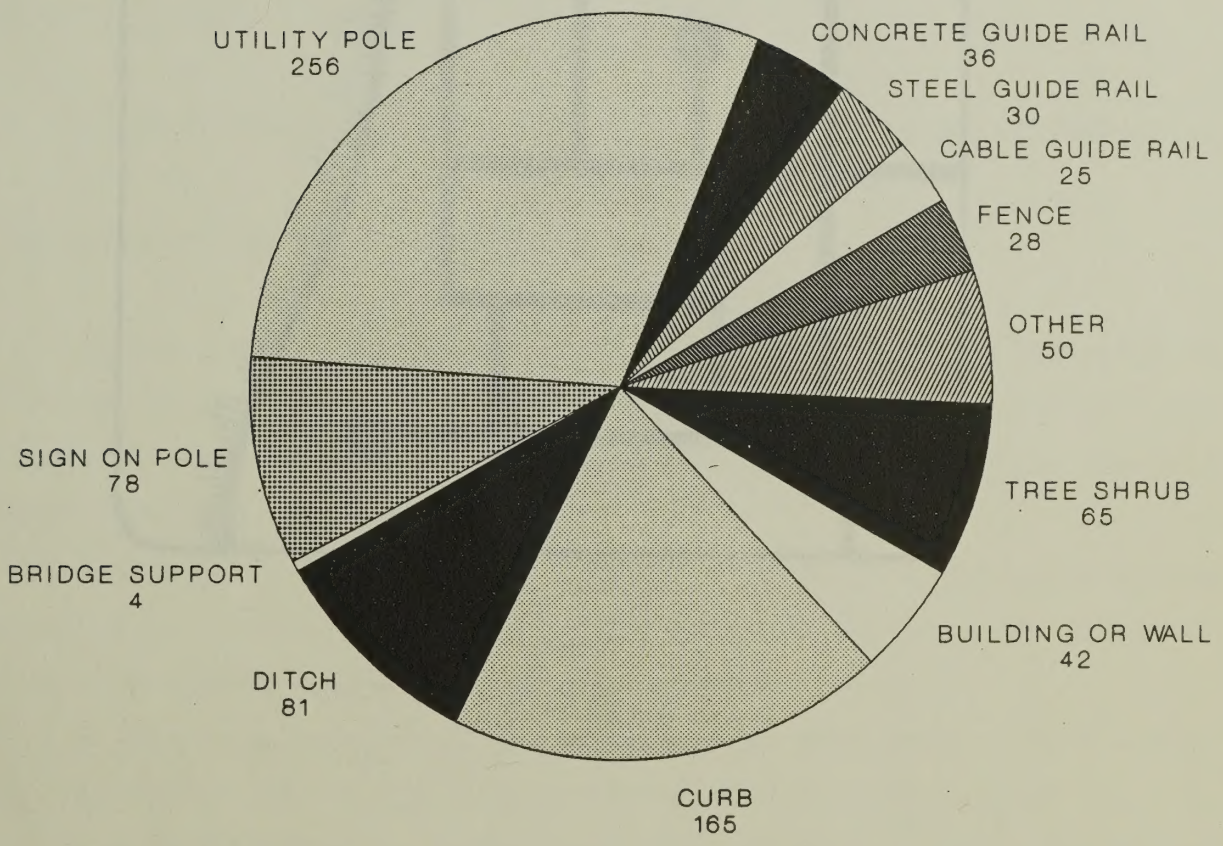
Exhibit 5.6 LOCATION OF COLLISIONS



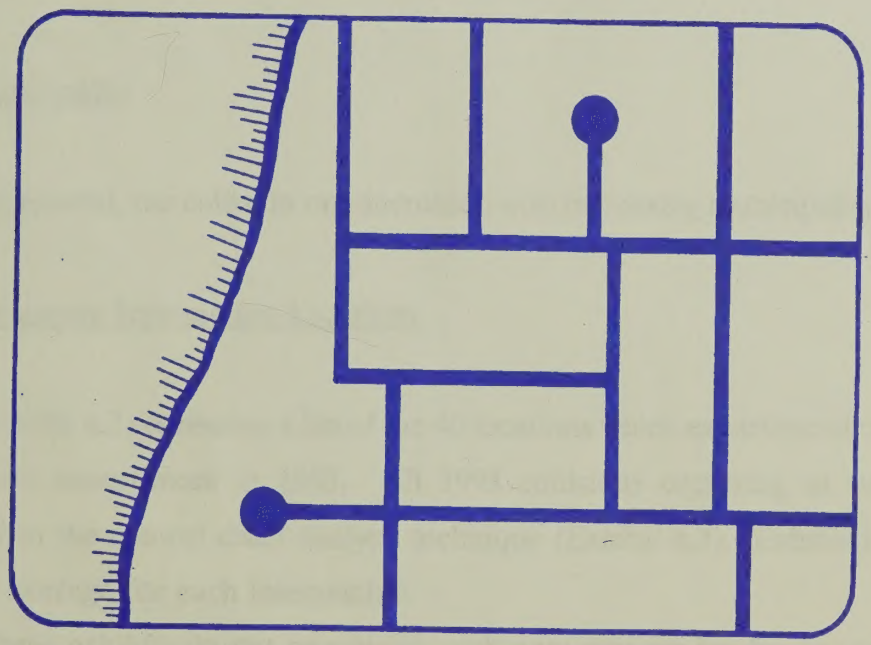
THE LARGEST NUMBER OF COLLISIONS OCCURRED IN, OR NEAR INTERSECTIONS

Exhibit 5.7

TYPES OF FIXED OBJECTS STRUCK IN MOTOR VEHICLE COLLISIONS

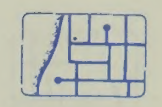


DRIVERS HITTING FIXED OBJECTS ARE MOST LIKELY TO STRIKE UTILITY OR SIGN POLES OR CURBS.



Chapter Six
Locations

Chapter Six
Locations



Chapter 6

General

Locations that have high numbers or rates of collision occurrences have received regular attention by roadway authorities in the Region and countermeasures are constantly being implemented for existing facilities and incorporated into the design of new facilities. However, physical alterations are not effective in preventing the majority of traffic collisions which are the direct result of driver or pedestrian error.

Area Municipality

In general, the collision rate increased with increasing municipality size (Exhibit 6.1).

High Frequency Intersection Locations

Exhibit 6.2 represents a list of the 46 locations which experienced the highest number of collision occurrences in 1993. All 1993 collisions occurring at traffic signals were subjected to the control chart analysis technique (Exhibit 6.3). Exhibit 6.2 also provides a five year average for each intersection.

These exhibits do not necessarily represent priority list for improvements as other factors have to be taken into account such as cost-benefit considerations or the deployment of other collision countermeasures which may be more cost-effective.

In many cases, countermeasures have already been implemented or these locations are under consideration for various forms of improvement on a priority basis.

Exhibits 6.4, 6.5 and 6.6 provide data on rates of collision occurrence on roadway sections, showing the 25 sections of major roadway with the highest rates. Exhibit 6.4 shows rates calculated including all collisions on the roadway sections. Exhibit 6.5 shows rates which include collisions at unsignalized intersections but exclude collisions at signalized intersections. Exhibit 6.6 shows rates which are calculated excluding any collisions occurring within 9 m of an intersection (signalized or unsignalized).

Comparison of Hamilton and Hamilton-Wentworth with other Cities

On the basis of total collisions per 1000 population, Hamilton and Hamilton-Wentworth are very close to the lowest rates in Canada (Exhibit 6.7). On the basis of injury collisions per 1000 population, the City and Region are better than average.

On the basis of fatal collisions per 100,000 population (Exhibit 6.8) Hamilton has one of the best records of cities of similar size in North America.

Exhibit 6.1

COLLISIONS vs AREA MUNICIPALITY

MUNICIPALITY	CLASS OF COLLISION (a) FATAL	NON-FATAL INJURY	PROPERTY DAMAGE ONLY	ALL COLLISIONS (b)	1993 COLLISIONS RATE PER 1,000 POP.(c)
ANCASTER	0	84	172	256	11.6
DUNDAS	1	73	160	234	10.7
FLAMBOROUGH	3	71	181	255	8.7
GLANBROOK	0	35	74	109	11.1
CITY OF HAMILTON	8	1886	4357	6251	19.6
STONEY CREEK	3	162	398	563	11.3
TOTAL FOR THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH	15	2311	5342	7668	17.0

(a) Collisions reported to the Hamilton-Wentworth Regional Police only; areas patrolled by the Provincial Police (e.g. Kings Highways) are not included.

(b) Location data missing from a small number of collisions.

(c) Population figure extrapolated based on 1988 population data for each municipality.

Exhibit 6.2

INTERSECTIONS WITH THE HIGHEST NUMBER OF COLLISIONS IN 1993 (a)

	INTERSECTION	TYPE OF TRAFFIC CONTROL	NUMBER OF COLLISIONS	5 YEAR AVERAGE
1	MAIN H & WELLINGTON H	TRAFFIC SIGNAL	26	14.2
2	DUNDURN & MAIN H	TRAFFIC SIGNAL	24	21.4
3	MOHAWK H & UPPER OTTAWA	TRAFFIC SIGNAL	22	22.0
4	BARTON & GAGE	TRAFFIC SIGNAL	21	12.2
5	JOHN H & WILSON H	TRAFFIC SIGNAL	20	12.8
6	MAIN & VICTORIA AV H	TRAFFIC SIGNAL	20	13.4
7	NASH & QUEENSTON H	TRAFFIC SIGNAL	20	14.4
8	BARTON H & CENTENNIAL PKWY	TRAFFIC SIGNAL	16	13.2
9	CAROLINE & KING H	TRAFFIC SIGNAL	16	11.0
10	DUNDURN & KING H	TRAFFIC SIGNAL	16	16.8
11	LIMERIDGE RD & UPPER WENTWORTH	TRAFFIC SIGNAL	16	10.8
12	MOHAWK H & UPPER JAMES	TRAFFIC SIGNAL	16	13.4
13	ABERDEEN H & DUNDURN	TRAFFIC SIGNAL	15	11.6
14	BAY & MAIN H	TRAFFIC SIGNAL	15	17.4
15	MOHAWK H & UPPER WENTWORTH	TRAFFIC SIGNAL	15	10.2
16	BARTON H & WOODWARD H	TRAFFIC SIGNAL	14	11.0
17	DUNDURN & YORK BL	TRAFFIC SIGNAL	14	9.6
18	GARTH & MOHAWK H	TRAFFIC SIGNAL	14	9.2
19	LIMERIDGE RD & UPPER GAGE	TRAFFIC SIGNAL	14	11.6
20	MAIN H & PARKDALE	TRAFFIC SIGNAL	14	7.2
21	RYMAL & UPPER JAMES	TRAFFIC SIGNAL	14	9.6
22	BAY & KING H	TRAFFIC SIGNAL	13	8.6

	INTERSECTION	TYPE OF TRAFFIC CONTROL	NUMBER OF COLLISIONS	5 YEAR AVERAGE
23	CANNON & GAGE	TRAFFIC SIGNAL	13	10.8
24	CENTENNIAL PKWY & QUEENSTON S	TRAFFIC SIGNAL	13	15.4
25	KENILWORTH ACC & MOUNTAIN BROW BL	TRAFFIC CIRCLE	13	7.8
26	MAIN H & OTTAWA	TRAFFIC SIGNAL	13	7.8
27	MAIN H & WENTWORTH	TRAFFIC SIGNAL	13	7.2
28	MOHAWK H & UPPER SHERMAN	TRAFFIC SIGNAL	13	8.0
29	CANNON & SANFORD	TRAFFIC SIGNAL	12	5.0
30	CATHARINE & REBECCA	WB STOP	12	5.6
31	FENNELL & UPPER SHERMAN	TRAFFIC SIGNAL	12	6.6
32	GARTH & LIMERIDGE RD	TRAFFIC SIGNAL	12	12.4
33	JOHN H & MAIN H	TRAFFIC SIGNAL	12	18.0
34	FENNELL & UPPER JAMES	TRAFFIC SIGNAL	11	7.6
35	KING H & OTTAWA	TRAFFIC SIGNAL	11	5.6
36	KING H & WELLINGTON H	TRAFFIC SIGNAL	11	6.4
37	MOHAWK H & UPPER WELLINGTON	TRAFFIC SIGNAL	11	8.0
38	BARTON H & JOHN H	TRAFFIC SIGNAL	10	7.4
39	BARTON H & KENILWORTH	TRAFFIC SIGNAL	10	7.4
40	CANNON & KENILWORTH	TRAFFIC SIGNAL	10	8.4
41	CANNON & MACNAB H	NB STOP	10	6.0
42	FENNELL & WEST 5TH	TRAFFIC SIGNAL	10	5.0
43	JAMES ST H & MAIN H	TRAFFIC SIGNAL	10	9.0
44	KING H & QUIGLEY	TRAFFIC SIGNAL	10	8.4
45	MAIN H & TRAGINA	SB STOP	10	3.6
46	STONE CHURCH & UPPER JAMES	TRAFFIC SIGNAL	10	6.6

(a) Only collisions occurring within 31 feet (9.5 m) of the intersection are defined as being "in" the intersection and are included in this list.

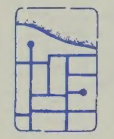
Exhibit 6.3

SIGNALIZED INTERSECTIONS WITH THE HIGHEST COLLISION RATES IN 1993

	INTERSECTION		RL (a)	RC (b)	RL/RC	1990 AWDT (c)	NUMBER OF COLLISIONS 1989	1990	1991	1992	1993	5 YR AVG.	COMMENTS
1	MOHAWK RD	& UPPER OTTAWA ST	2.4	0.9	2.5	28066	30	18	16	24	22	22.0	(e)
2	CHARLTON AVE	& HESS ST	1.7	1.1	1.6	11201	7	6	8	6	5	6.4	
3	LIMERIDGE RD	& GARTH ST	1.7	1.0	1.7	24134	6	18	8	18	12	12.4	
4	WILSON ST	& JOHN ST	1.5	1.0	1.6	23950	14	10	11	9	20	12.8	
5	QUEENSDALE AVE	& UPPER GAGE AVE	1.5	1.1	1.4	12980	9	8	3	8	7	7.0	(h)
6	LIMERIDGE RD	& UPPER WENTWORTH	1.5	1.0	1.5	24105	15	12	5	6	16	10.8	
7	STONE CHURCH RD	& UPPER WENTWORTH	1.4	1.1	1.3	15228	99	99	99	5	6	5.5	
8	HUNTER ST	& CATHARINE ST	1.4	1.1	1.2	12397	19	2	3	2	0	5.2	(d)
9	KING WILLIAM ST	& CATHARINE ST	1.3	1.1	1.2	7310	2	2	6	4	7	4.2	
10	LIMERIDGE RD	& UPPER GAGE AVE	1.3	1.0	1.4	26854	12	10	8	14	14	11.6	
11	PARKSIDE DR	& HAMILTON ST	1.3	1.1	1.2	8522	99	99	99	99	4	4.0	
12	YORK BLVD	& HESS ST	1.3	1.0	1.3	20755	11	10	16	6	6	9.8	
13	HUNTER ST	& CAROLINE ST	1.3	1.2	1.1	8171	7	1	3	4	2	3.4	
14	MAIN ST	& JOHN ST	1.2	0.9	1.4	41203	34	29	7	8	12	18.0	(f)
15	CANNON ST	& GAGE AVE	1.2	1.0	1.3	25248	14	17	4	6	13	10.8	
16	BARTON ST	& GAGE AVE	1.2	0.9	1.3	30198	13	6	9	12	21	12.2	
17	MAIN ST	& DUNDURN ST	1.2	0.9	1.4	48628	26	17	26	14	24	21.4	
18	ABERDEEN AVE	& DUNDURN ST	1.2	0.9	1.3	30674	6	11	14	12	15	11.6	
19	CHARLTON AVE	& QUEEN ST	1.2	1.0	1.2	16076	9	7	9	7	4	7.2	
20	QUEENSDALE AVE	& UPPER WENTWORTH	1.2	1.1	1.1	12980	16	1	2	3	5	5.4	
21	BARTON ST	& JOHN ST	1.1	1.0	1.1	20217	10	6	8	3	10	7.4	
22	QUEENSTON RD	& NASH RD	1.1	0.9	1.2	36779	17	8	10	17	20	14.4	
23	FENNELL AVE	& GARTH ST	1.1	0.9	1.2	37118	20	12	18	12	9	14.2	
24	BRAMPTON ST	& WOODWARD AVE	1.1	1.1	1.0	12948	8	7	6	4	1	5.2	

	INTERSECTION		RL (a)	RC (b)	RL/RC	1990 AWDT (c)	NUMBER OF COLLISIONS 99	99	99	99	4	5 YR AVG.	COMMENTS
25	HADELAND AVE	& UPPER PARADISE RD	1.1	1.1	1.0	13244	99	99	99	99	4	4.0	
26	KENTLEY DR	& NASH RD	1.1	1.1	1.0	13178	5	8	6	2	3	4.8	
27	CHARLTON AVE	& SHERMAN ACCESS	1.1	1.0	1.1	21040	9	7	11	7	4	7.6	
28	MAIN ST	& BAY ST	1.0	0.9	1.2	43207	25	15	16	16	15	17.4	(i)
29	HUNTER ST	& BAY ST	1.0	1.0	1.0	14740	8	7	4	4	5	5.6	
30	BARTON ST	& WOODWARD AVE	1.0	0.9	1.1	31856	19	6	6	10	14	11.0	
31	KING ST	& CAROLINE ST	1.0	0.9	1.1	32293	12	12	8	7	16	11.0	
32	CHARLTON AVE	& JAMES ST	1.0	1.0	1.0	24259	10	6	8	13	4	8.2	
33	HUNTER ST	& HESS ST	1.0	1.1	0.9	10443	5	2	3	6	1	3.4	
34	KING ST	& DUNDURN ST	1.0	0.9	1.1	47961	18	16	14	20	16	16.8	
35	BARTON ST	& BAY ST	0.9	1.1	0.9	12862	4	5	3	4	4	4.0	
36	MAIN ST	& PARKDALE AVE	0.9	1.0	1.0	23238	2	9	4	7	14	7.2	
37	CANNON ST	& JAMES ST	0.9	0.9	1.0	28207	10	11	9	7	9	9.2	
38	JACKSON ST	& JOHN ST	0.9	1.0	0.9	19123	8	6	8	4	7	6.6	
39	GOVERNORS RD	& OGILVIE ST (DUN)	0.9	1.0	0.9	17751	8	8	3	4	3	5.2	
40	FENNELL AVE	& CLARENDON AVE	0.9	1.0	0.9	15534	11	7	3	4	3	5.6	
41	BURLINGTON ST	& GAGE AVE	0.9	1.0	1.0	24443	15	6	12	5	3	8.2	
42	KING ST	& PARKDALE AVE	0.9	0.9	1.0	32463	15	7	9	10	7	9.6	
43	MAIN ST	& VICTORIA AVE	0.9	0.9	1.0	41004	19	9	9	10	20	13.4	
44	LIMERIDGE RD	& UPPER JAMES ST	0.9	0.9	1.0	36008	15	8	11	9	9	10.4	
45	RYMAL RD	& WEST 5th ST	0.9	1.0	0.9	21394	99	99	99	99	6	6.0	
46	COOTES DR	& OLYMPIC DR	0.9	1.0	0.9	19378	6	6	8	7	8	7.0	
47	FENNELL AVE	& UPPER OTTAWA ST	0.9	0.9	0.9	29022	22	8	3	5	2	8.0	(g)
48	CANNON ST	& JOHN ST	0.9	1.0	0.9	29642	10	4	4	11	9	7.6	
49	MAIN ST	& WELLINGTON ST	0.9	0.9	1.0	46144	17	10	12	6	26	14.2	
50	KING ST	& JAMES ST	0.9	0.9	0.9	26413	12	10	9	2	7	8.0	
OVERALL STATISTICS FOR ALL SIGNALS:				**0.6**								**4.8**	

NUMBER OF HAMILTON-WENTWORTH TRAFFIC SIGNALS IN OPERATION AS OF JAN. 1, 1993 = 348



Notes:

(a) RL is the number of collisions, per million vehicles entering the intersection, occurring within 31 feet of an individual intersection.

(b) RC is a volume-adjusted critical rate. If RL exceeds RC (ie. RL/RC is greater than 1.0), one can state with 95 percent confidence that the collision rate at the intersection in question is significantly higher than would normally be expected.

RC = Ra +K(the square root of:(Ra/m))-(0.5/m)

Where: Ra = systemwide average collision rate for all traffic signal locations (0.72 collisions per million vehivle entries)

K = constant (=1.65 for 95 % confidence level)

m = vehicle exposure at the location in million vehicles entering per year (AWDTx340/1,000,000)

(c) AWDT - Average Weekday Daily Traffic (total vehicles entering the intersection).

REGARDING SPECIFIC INTERSECTIONS:

(d) Signalized in 1990 - collision rate has been greatly reduced.
(e) Reconstructed in 1993 to provide channelized left turn lanes.
(f) Intersection provided with physical barriers to discourage illegal northbound movements in "must turn lane" in 1991.
(g) Reconstructed to provide left turn channelization in 1990.
(h) Left turn lanes painted in 1990.
(i) Temporary delineation to discourage illegal movements installed in 1991. Permanent installation placed in 1993.

Exhibit 6.4

ROADWAY SECTIONS WITH THE HIGHEST COLLISION RATES, 1989 - 1993

CITY OF HAMILTON ARTERIALS

(ALL INTERSECTIONS INCLUDED) (a)

	Arterial Street	From	To	Number of Collisions	RL	RC	Ratio	Link Length (Km)	Link Volume (AWDT)	Million Veh-Km Per Year
1.	DALEWOOD AVE	KING H	MAIN H	11.0	22.00	9.27	2.37	0.220	1313	0.10
2.	JAMES ST H	BARTON H	MURRAY	24.0	20.00	8.52	2.35	0.120	5786	0.24
3.	CANNON	GAGE	OTTAWA	162.0	16.04	5.98	2.68	0.866	6688	2.02
4.	QUEENSTON H	NASH	CITY LIMITS	194.0	12.05	5.60	2.15	0.823	11175	3.22
5.	CANNON	SHERMAN	GAGE	147.0	11.40	5.77	1.98	0.891	8278	2.58
6.	KING H	QUEEN H	JAMES ST H	345.0	10.50	5.13	2.05	0.860	21842	6.57
7.	MAIN H	OTTAWA	KENILWORTH	201.0	9.93	5.43	1.83	0.836	13845	4.05
8.	JAMES ST H	KING N BRANCH	BARTON H	144.0	9.93	5.68	1.75	0.860	9634	2.90
9.	CHARLTON	JAMES ST H	JOHN H	37.0	9.87	7.04	1.40	0.244	8840	0.75
10.	CANNON	OTTAWA	BARONS	130.0	9.35	5.71	1.64	1.190	6688	2.78
11.	JOHN H	ST JOSEPHS	KING N BRANCH	249.0	9.34	5.25	1.78	0.976	15613	5.33
12.	BAY	KING H	CANNON	71.0	9.28	6.25	1.48	0.450	9702	1.53
13.	CHARLTON	QUEEN H	JAMES ST H	94.0	9.08	5.96	1.52	0.823	7211	2.07
14.	BARTON H	GAGE	OTTAWA	257.0	8.88	5.20	1.71	0.860	19256	5.79
15.	JAMES ST H	ST JOSEPHS	KING N BRANCH	241.0	8.59	5.22	1.65	0.968	16578	5.61
16.	YORK BL	QUEEN H	JAMES ST H	186.0	8.38	5.37	1.56	0.921	13784	4.44
17.	KING H	GAGE	MAIN H	118.0	8.34	5.70	1.46	0.610	13281	2.83
18.	BAY	HERKIMER	KING H	146.0	8.25	5.53	1.49	0.924	10950	3.54
19.	BARTON H	JAMES ST H	WELLINGTON H	176.0	8.19	5.39	1.52	0.836	14711	4.30
20.	JOHN H	KING H	BARTON H	120.0	8.05	5.66	1.42	0.872	9768	2.98
21.	STINSON ST	VICTORIA AV H	WENTWORTH	41.0	7.88	6.66	1.18	0.665	4473	1.04
22.	MAIN H	JAMES ST H	WELLLINGTON H	314.0	7.62	5.01	1.52	0.866	27208	8.24
23.	KING H	WELLINGTON H	WENTWORTH	284.0	7.56	5.06	1.49	0.866	24800	7.51
24.	BARTON H	QUEEN H	JAMES ST H	113.0	7.41	5.64	1.31	0.872	10004	3.05
25.	MAIN H	PARADISE	DUNDURN	232.0	7.31	5.15	1.42	0.907	20024	6.35
	ALL CITY OF HAMILTON ARTERIAL STREETS				3.93					

(a) Please refer to Notes on page 78.

Notes: Re: Collision Rates on Roadway Sections

1. Exhibit 6.4 includes all collisions on an arterial roadway section. If the roadway section ends at an intersection, signalized or unsignalized, one-half the number of collisions occurring at the intersection is included.

2. Exhibit 6.5 includes all collisions on an arterial roadway section excluding those which occur within nine metres of a signalized intersection. If the roadway section ends at an unsignalized intersection, one-half the number of collisions occurring at the intersection is included.

3. Exhibit 6.6 includes only collisions on an arterial roadway section which occur greater than nine metres from any intersection. That is, no collisions referenced to an intersection, signalized or unsignalized, are included.

4. R_L is the collision rate for the roadway section expressed as collisions per million vehicle kilometres travelled per annum.

5. R_C is a volume-adjusted critical rate. If R_L exceeds R_C (i.e. R_L/R_C is greater than 1.00), one can state with 95 percent confidence that the collision rate for the roadway section in question is significantly higher than would normally be expected.

$$R_c = R_a + K\sqrt{\frac{R_a}{m} + \frac{0.5}{m}}$$

where R_a = systemwide average collision rate for all roadway sections:
3.93 collisions per million vehicle kilometres in 1989-1993 for Exhibit 6-4;
2.26 collisions per million vehicle kilometres in 1989-1993 for Exhibit 6-5;
1.44 collisions per million vehicle kilometres in 1989-1993 for Exhibit 6-6.

K = constant = 1.65 (for 95% confidence level)

m = vehicle exposure for the individual roadway section in million vehicle kilometres per year:

$$\frac{(AWDT \times 349.6 \times Section\ length)}{10^6}$$

6. AWDT - Average Weekday Daily Traffic

Exhibit 6.5

ROADWAY SECTIONS WITH THE HIGHEST COLLISION RATES, 1989 - 1993

CITY OF HAMILTON ARTERIALS

(SIGNALIZED INTERSECTIONS NOT INCLUDED) (a)

	Arterial Street	From	To	Number of Collisions	RL	RC	Ratio	Link Length (Km)	Link Volume (AWDT)	Million Veh-Km Per Year
1.	DALEWOOD AV	KING H	MAIN H	8.0	16.00	5.10	3.14	0.220	1313	0.10
2.	JAMES ST H	BARTON H	MURRAY	14.0	11.67	5.24	2.23	0.120	5786	0.24
3.	CANNON	GAGE	OTTAWA	83.0	8.22	3.76	2.19	0.866	6688	2.02
4.	STINSON ST	VICTORIA AV H	WENTWORTH	41.0	7.88	4.21	1.87	0.665	4473	1.04
5.	CANNON	SHERMAN AV	GAGE	99.0	7.67	3.61	2.12	0.891	8278	2.58
6.	JAMES ST H	MURRAY	BURLINGTON	70.0	7.11	3.77	1.89	0.890	6336	1.97
7.	QUEENSTON H	NASH	CITY LIMITS	108.0	6.71	3.49	1.92	0.823	11175	3.22
8.	BARTON H	GAGE	OTTAWA	179.0	6.18	3.20	1.93	0.860	19256	5.79
9.	MAIN H	OTTAWA	KENILWORTH	125.0	6.17	3.37	1.83	0.836	13845	4.05
10.	CHARLTON	JAMES ST H	JOHN H	23.0	6.13	4.46	1.37	0.244	8840	0.75
11.	CANNON	OTTAWA	BARONS	84.0	6.04	3.57	1.69	1.190	6688	2.78
12.	CHARLTON	QUEEN H	JAMES ST H	60.0	5.80	3.74	1.55	0.823	7211	2.07
13.	WEST 5TH	RYMAL	STONE CHURCH	18.0	5.71	4.59	1.24	1.021	1769	0.63
14.	BARTON H	QUEEN H	JAMES ST H	84.0	5.51	3.52	1.57	0.872	10004	3.05
15.	KING H	GAGE	MAIN H	78.0	5.51	3.56	1.55	0.610	13281	2.83
16.	KENILWORTH	KENILWORTH ACCES	MAIN H	131.0	5.39	3.28	1.64	0.695	19991	4.86
17.	KING H	QUEEN H	JAMES ST H	175.0	5.33	3.15	1.69	0.860	21842	6.57
18.	LIMERIDGE RD	UPPER WENTWORTH	UPPER SHERMA	120.0	5.31	3.32	1.60	0.808	15992	4.52
19.	ARKLEDUN	JOLLEY CUT	JOHN H	60.0	5.08	3.66	1.39	0.400	16892	2.36
20.	WENTWORTH	BARTON H	BURLINGTON	46.0	4.97	3.81	1.30	1.031	5134	1.85
21.	KING H	WELLINGTON H	WENTWORTH	186.0	4.95	3.10	1.60	0.866	24800	7.51
22.	JAMES ST H	KING N BRANCH	BARTON H	71.0	4.90	3.54	1.38	0.860	9634	2.90
23.	MAIN H	KENILWORTH	BERRY AV	148.0	4.87	3.18	1.53	0.702	24768	6.08
24.	BAY	KING H	CANNON	37.0	4.84	3.94	1.23	0.450	9702	1.53
25.	BARTON H	WELLINGTON H	WENTWORTH	128.0	4.82	3.24	1.49	0.872	17414	5.31
	ALL CITY OF HAMILTON ARTERIAL STREETS				2.26					

(a) Please refer to Notes on page 78.

LOCATIONS

Exhibit 6.6

ROADWAY SECTIONS WITH THE HIGHEST COLLISION RATES, 1989 - 1993

CITY OF HAMILTON ARTERIALS

(INTERSECTIONS NOT INCLUDED) (a)

	Arterial Street	From	To	Number of Collisions	RL	RC	Ratio	Link Length (Km)	Link Volume (AWDT)	Million Veh-Km Per Year
1.	QUEENSTON H	NASH	CITY LIMITS	101.0	6.27	2.39	2.62	0.823	11175	3.22
2.	KING H	QUEEN H	JAMES ST H	175.0	5.33	2.14	2.49	0.86	21842	6.57
3.	LIMERIDGE RD	UPPER WENTWORTH	UPPER SHERMA	115.0	5.09	2.26	2.25	0.808	15992	4.52
4.	JAMES ST H	BARTON H	MURRAY	6.0	5.00	3.40	1.47	0.120	5786	0.24
5.	ARKLEDUN	JOLLEY CUT	JOHN H	51.0	4.32	2.52	1.71	0.400	4430	1.89
6.	KENILWORTH	KENILWORTH ACCES	MAIN H	88.0	3.62	2.24	1.62	0.695	19991	4.86
7.	ST JOSEPHS	JAMES ST H	JOHN H	27.0	3.55	2.72	1.31	0.256	16970	1.52
8.	MAIN H	PARADISE	DUNDURN	110.0	3.46	2.15	1.61	0.907	20024	6.35
9.	JAMES ST H	KING N BRANCH	BARTON H	50.0	3.45	2.43	1.42	0.860	9634	2.90
10.	MOUNTAIN BROW B	MOHAWK H	LIMERIDGE RD	32.0	3.39	2.62	1.29	1.220	4430	1.89
11.	CANNON	SHERMAN	GAGE	43.0	3.33	2.48	1.34	0.891	8278	2.58
12.	YORK BL	QUEEN H	JAMES ST H	72.0	3.24	2.27	1.43	0.921	13784	4.44
13.	BARTON H	GAGE	OTTAWA	93.0	3.21	2.18	1.47	0.860	19256	5.79
14.	UPPER JAMES	LIMERIDGE RD	MOHAWK H	153.0	3.18	2.02	1.57	1.049	26199	9.61
15.	CANNON	GAGE	OTTAWA	32.0	3.17	2.59	1.22	0.866	6688	2.02
16.	STINSON ST	VICTORIA AV H	WENTWORTH	16.0	3.08	2.90	1.06	0.665	4473	1.04
17.	MAIN H	OTTAWA	KENILWORTH	60.0	2.96	2.30	1.29	0.836	13845	4.05
18.	GAGE	LAWRENCE RD	KING H	30.0	2.94	2.58	1.14	0.982	5938	2.04
19.	CHARLTON	WELLINGTON H	WENTWORTH	56.0	2.92	2.32	1.26	0.854	12835	3.83
20.	BAY	KING H	CANNON	22.0	2.88	2.71	1.06	0.450	9702	1.53
21.	WEST 5TH	RYMAL	STONE CHURCH	9.0	2.86	3.14	0.91	1.021	1769	0.63
22.	WENTWORTH	DELAWARE	KING H	20.0	2.82	2.75	1.03	0.500	8122	1.42
23.	BARTON H	JAMES ST H	WELLINGTON H	60.0	2.79	2.28	1.22	0.836	14711	4.30
24.	KING H	WELLINGTON H	WENTWORTH	102.0	2.72	2.10	1.30	0.866	24800	7.51
25.	MAIN H	KING H	OTTAWA	47.0	2.69	2.36	1.14	0.366	27254	3.49
	ALL CITY OF HAMILTON ARTERIAL STREETS				1.44					

(a) Please refer to Notes on page 78.

Exhibit 6.7

1993 COLLISION STATISTICS – SELECTED CANADIAN CITIES

CITY OR REGIONAL MUNICIPALITY	POPULATION	PROPERTY DAMAGE ONLY COLLISION REPORTING LEVEL	COLLISION REPORTING CRITERIA (1) (a)	(b)	(c)	(d)	Other	TOTAL COLLISIONS	COLLISIONS /1000 POPULATION	INJURY COLLISIONS	INJURY COLLISIONS /1000 POPULATION
CITIES											
HAMILTON	318,947 (1991)	700	N	N	Y	Y	f	6,251	19.6	1,894	5.9
BURLINGTON (1991)	129,500	700	Y	Y	Y	Y	e, f	1,593	12.3	570	4.4
CALGARY (1992)	717,133	1000	N	N	N	Y	e, f	27,789	38.8	2,362	3.3
EDMONTON	626,999	1000	N	N	N	Y		19,368	30.9	4,750	7.6
GUELPH (1991)	87,000	700	Y	Y	Y	Y	e, f	1,334	15.3	398	4.6
HALIFAX	114,455	500	Y	Y	Y	Y		4,306	37.6	696	6.1
LONDON	316,000	700	Y	Y	Y	Y		7,960	25.2	3,001	9.5
MONTREAL	1,019,000	500	N	N	N	Y	g	25,829	25.3	5,012	4.9
MISSISSAUGA	498,600	700	N	N	N	Y		5,297	10.6	1,069	2.1
REGINA	179,178	1000	N	N	N	Y	f	5,585	31.2	1,577 (2)	8.8
ST. CATHARINES (1992)	124,689	700	Y	Y	Y	Y	f	2,932	23.5	N/A	N/A
SASKATOON	187,000	1000	N	N	N	Y	f	5,812	31.1	1,302 (3)	6.9
METRO TORONTO(1991)	2,187,000	1000	Y	Y	Y	Y	e, f	53,029	24.2	18,624 (3)	8.5
VANCOUVER	494,487	1000	N	N	N	Y	f	21,631	43.7	5,702	11.5
WINDSOR (1992)	191,000	1000	Y	Y	Y	Y		7,164	37.5	2,312	12.1
WINNIPEG	630,172	1000	Y	Y	Y	Y		18,067	28.7	9,628	15.3

CITY OR REGIONAL MUNICIPALITY	POPULATION	PROPERTY DAMAGE ONLY COLLISION REPORTING LEVEL	COLLISION REPORTING CRITERIA (1) (a)	(b)	(c)	(d)	Other	TOTAL COLLISIONS	COLLISIONS /1000 POPULATION	INJURY COLLISIONS	INJURY COLLISIONS /1000 POPULATION
REGIONS											
REGIONAL HAMILTON–WENTWORTH (4)	451,684	$700	N	N	Y	Y	f	7,674	17.0	2,313	5.1
REGION OF HALTON	331,045	700	N	N	Y	Y		5,337	16.1	978	3.0
REGIONAL OTTAWA–CARLTON	696,045	700	Y	Y	Y	Y	f	17,584	25.3	4,439	6.4
REGIONAL MUNICIPALITY OF PEEL (5)	784,500	700	N	N	N	Y	e	3,229	4.1	770	1.0
REGIONAL WATERLOO (1991)	389,817	700	Y	Y	Y	Y	f	9,471	24.3	1,421	3.6

(1) KEY TO CRITERIA FOR REPORTING COLLISIONS (See next page for definitions of injury collisions)

It is generally assumed, unless otherwise noted, that only collisions occuring on public roadways involving personal injury or property damage greater than the reporting level are included on this table.

(a) Collisions reported involving an infraction of the Provincial Highway Traffic Act with property damage only and less than reporting level.

(b) Collisions reported involving an infraction of the Criminal Code of Canada with property damage only and less than reporting level.

(c) Hit and run collisions reported with property damage only and less than reporting level.

(d) Collisions reported if it involves any personal injury.

(e) Public property damage collisions.

(f) Collisions involving City or Regional government vehicles.

(2) Only injuries requiring medical attention were classified as injury collisions.

(3) Injury collisions do not include fatal accidents.

(4) Not including Kings Highways.

(5) Regional municipality statistics are for Regional roads only and do not include Burlington, in the case of Halton, or Mississauga, in the case of Peel. Thus, the collision rates stated will substantially underrepresent the actual rates.

DEFINITIONS OF "PERSONAL INJURY" (a)

Regional Hamilton-Wentworth	-	any bodily harm, visible or complained of, that results from a motor vehicle collision.
City of Hamilton	-	any bodily harm, visible or complained of, that results from a motor vehicle collision.
Burlington	-	any bodily harm, visible or complained of, that results from a motor vehicle collision.
Calgary	-	any type of injury resulting from a collision.
Edmonton	-	including minor abrasions and bruises, complaint of pain, caused by a motor vehicle collision.
Guelph	-	any bodily harm, visible or complained of, that results from a motor vehicle collision.
Halifax	-	injury or death (no stipulation regarding severity of injury) caused by a motor vehicle collision.
London	-	any type of injury, visible or complained of, caused by a collision; need not be treated at a hospital.
Mississauga	-	N/A
Montreal	-	any injury, apparent or not, to any person, caused directly or indirectly, by a motor vehicle.
Regina	-	any bodily harm, visible or complaint of, caused by the accident.
St. Catharines	-	any type of injury resulting from a collision.
Saskatoon	-	any bodily harm, visible or complaint of, caused by the accident.
Metro Toronto	-	injury must be reported when an injury occurs to any of the involved persons in a collision.
Vancouver	-	N/A
Windsor	-	any injury resulting from a motor vehicle collision.
Winnipeg	-	readily identifiable injury or perceived injury caused by a collision.

Region of Halton	-	any bodily harm, visible or complained of, that results from a motor vehicle collision.
Regional Ottawa-Carlton	-	injury is any bodily harm visible or complaint of, caused by a motor vehicle collision.
Region of Peel	-	any bodily harm, visible or complained of, that results from a motor vehicle collision.
Regional Waterloo	-	injury or death (no stipulation regarding severity of injury) caused by a motor vehicle collision.

(a) Definitions of a "personal injury" such that a collision involving a personal injury must be reported.

Exhibit 6.8

FATAL COLLISION STATISTICS (a)

NORTH AMERICAN CITIES

(Population 350,000 – 500,000)

CITY	FATALITIES 1992	RATE PER 100,000 POPULATION	RATE PER 10,000 REGISTERED VEHICLES
Virginia Beach, Va.	19	4.6	0.5
Buffalo, N.Y.(1989)	18	5.0	0.6
Minneapolis, Minn.	19	5.2	0.2
Baton Rouge, La.	20	5.3	0.6
Wichita, Kans.	21	5.5	0.7
Pittsburgh, Pa.	21	5.7	0.4
Omaha, Neb.(1989)	24	6.5	0.8
Seattle, Wash.(1989)	34	7.0	0.7
Hamilton, Ont. (b)	23	7.2	0.7
Charlotte, N.C.	30	7.6	0.6
Oakland, Cal.	34	9.1	1.1
Cincinnati, Ohio	33	9.1	0.4
Indianapolis, Ind.	34	9.2	0.5
Tulsa, Okla.	36	9.8	1.0
St. Louis, Mo.	38	9.6	0.4
Long Beach, Calif.	42	9.8	1.1
AVG. OF CITIES REPORTING		10.5	0.9
Denver, Colo.	53	11.2	0.7
Austin, Tex.	59	12.7	1.1
Toledo, Ohio (1989)	45	12.8	1.6
New Orleans, La.	64	12.9	1.9
Tucson, Ariz.	55	13.6	1.0
Miami, Fla.	49	13.7	0.5
Kansas City, Mo.	63	14.5	1.4
Albuquerque, N.M.	61	15.9	1.2
Fort Worth, Tex.	71	15.9	1.2
Oklahoma City, Okla.	74	16.6	1.4
Atlanta, Ga.	72	18.3	1.1
Nashville,Tn.(1989)	93	21.9	3.5

COMPARED TO THE 28 NORTH AMERICAN CITIES REPORTING HAVING POPULATIONS IN THE RANGE 350,000–500,000, HAMILTON HAS THE NINTH LOWEST RATE OF FATAL COLLISIONS BASED ON POPULATION. THE RATE IS ABOUT TWO–THIRDS OF THE REPORTED AVERAGE.

(a) SOURCE: Accident Facts, 1993 Edition,
National Safety Council, 1121 Spring Lake Drive, Itasca, Illinois

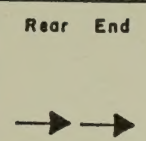
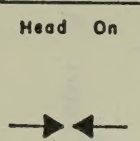
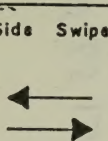
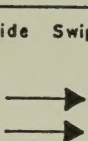
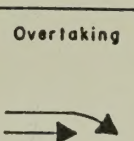
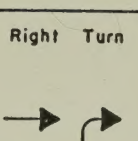
(b) Rate is for City of Hamilton only.

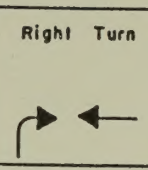
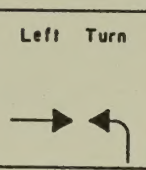
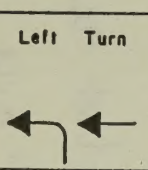
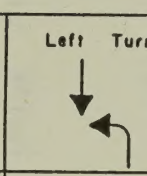
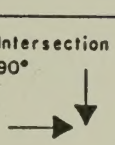
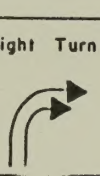
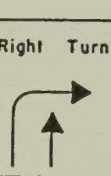
Appendix

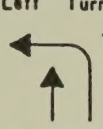
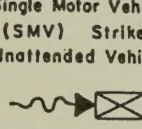
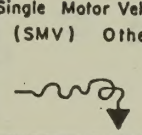
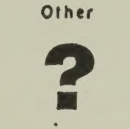
Appendix

INITIAL IMPACT TYPES AS DESCRIBED IN EXHIBIT 2.6

FIELD #45 MOTOR VEHICLE COLLISION REPORTING SYSTEM

Initial Impact Type Diagram						
	Rear End	Head On	Side Swipe	Side Swipe	Overtaking	Right Turn
Code Value	21	22	23	24	25	26
Short Name #	REAREND	HEADON	SDSWPOP	SDSWPSM	OVERTAK	RTRREND

						
Right Turn	Left Turn	Left Turn	Left Turn	Intersection 90°	Right Turn	Right Turn
27	28	29	30	31	32	33
RTONCOM	LTONCOM	LTRREND	LTOPTHR	RTANGLE	RTSDSWP	THR/RT

						
Left Turn	Left Turn	Single Motor Vehicle (SMV) Strikes Unattended Vehicle	Single Motor Vehicle (SMV) Other	Pedestrian / Vehicle	Left Turn / Right Turn	Other
34	35	36	37	38	39	98
LTSDSWP	THR/LT	SMVPARK	SMVOTHR	VEH/PED	LTRTSWP	OTHER

12. 17. 18. 23. 29. ~~30~~ 41. 42. 51. 57. 58. 59. 60. 65. 69. 70

Def. of "personal injury" ⇒ any bodily harm, visible or complained of, that results from a motor vehicle collision.

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